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EDGE

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Amazing stories:

France's **dream team** reaches for the big time

Issue **twenty** **20**

Voted **Magazine of the year**



Industry awards

Heart Of Darkness **is the vision of Amazing Studio – a team of talented designers working in the creative core of Paris. A visual tour de force, the project has long remained a closely guarded secret. The full story starts on page 42...**

Future PUBLISHING







The power curve: racing towards the unattainable…

As the videogames world prepares to usher in a new generation of technology, a faster and more advanced breed of machines is already waiting in the wings.

No other consumer electronics medium suffers so chronically from a constant shift towards higher performance levels. This is the bane of the development community: just as hopes and ambitions are building up around one set of emerging technologies, along comes a set of bolder, more exciting promises to tear them all down again.

The information gleaned by **Edge** about new hardware platforms from 3DO and Nintendo is just the latest instalment in a saga that unfolds with almost soap-opera regularity. A year ago the PlayStation was a phenomenon. Now it's a machine with competitors just like any other.

The accelerated rush towards even higher levels of 3D realism is proving an irresistable lure for developers and consumers alike. But as the silicon continues to evolve faster than the potential to exploit it, a technological rift is gradually forming between what is possible today and what could be achieved tomorrow.

But hope exists for those reluctant to jump on any particular bandwagon for fear of it stalling before it gathers pace. The continued acceptance of multiple platforms has brought with it an understanding of the importance of development across parallel architectures. Nowadays, portability is as crucial as the power that necessitates it.

The **future** is almost here…

inside EDGE issue 20

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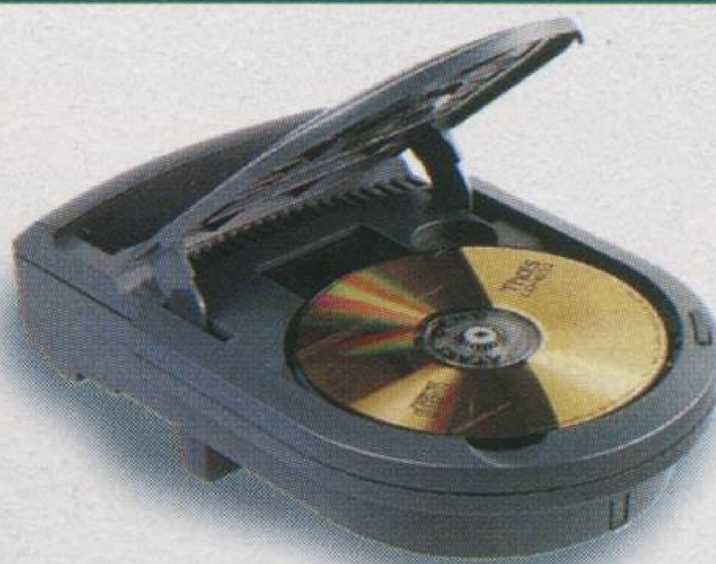


Photography: **Stuart Whale**



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SGI power (left), **Jag CD** (top right) and **AOU** show

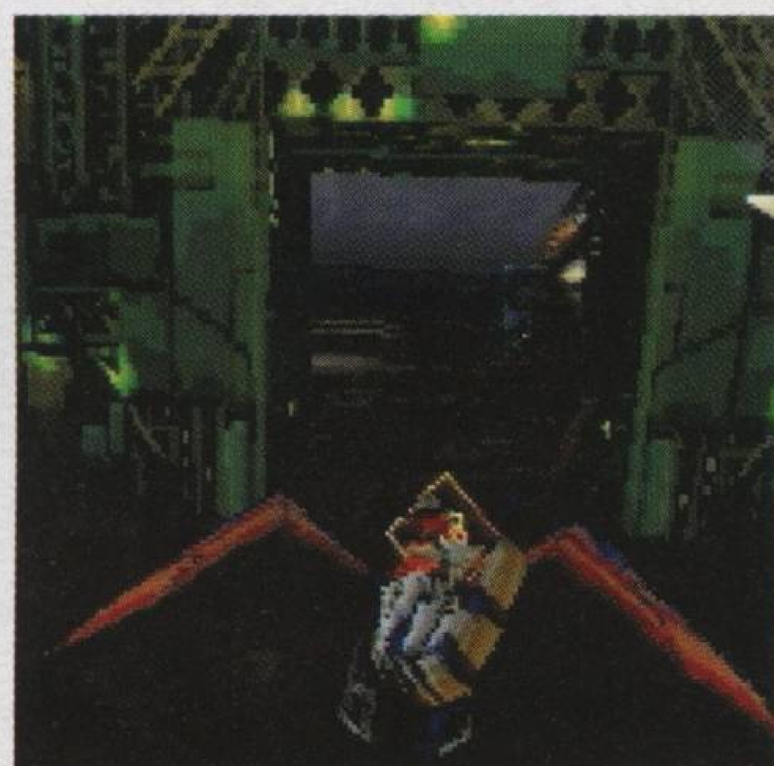
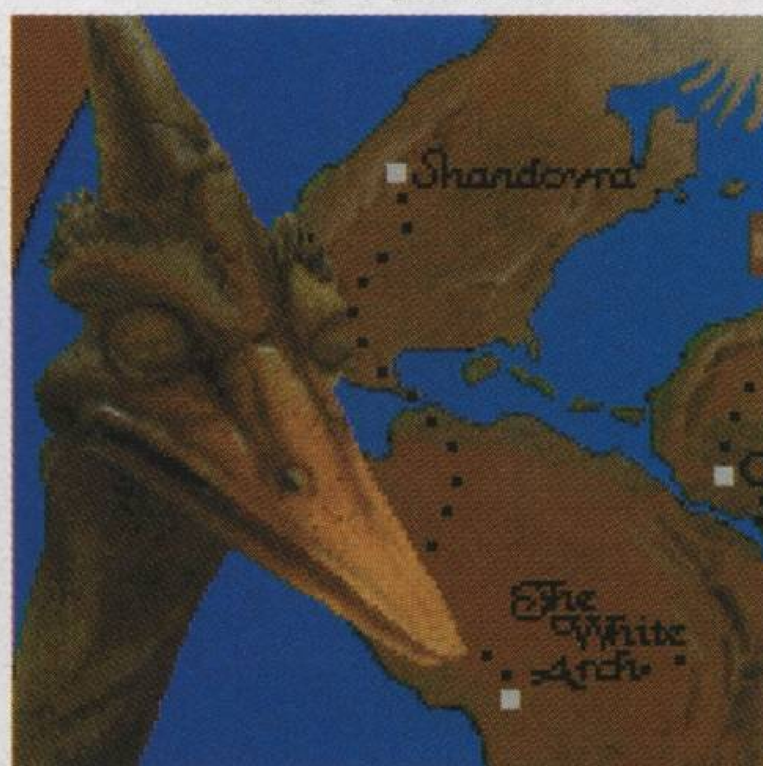
28 Prescreen



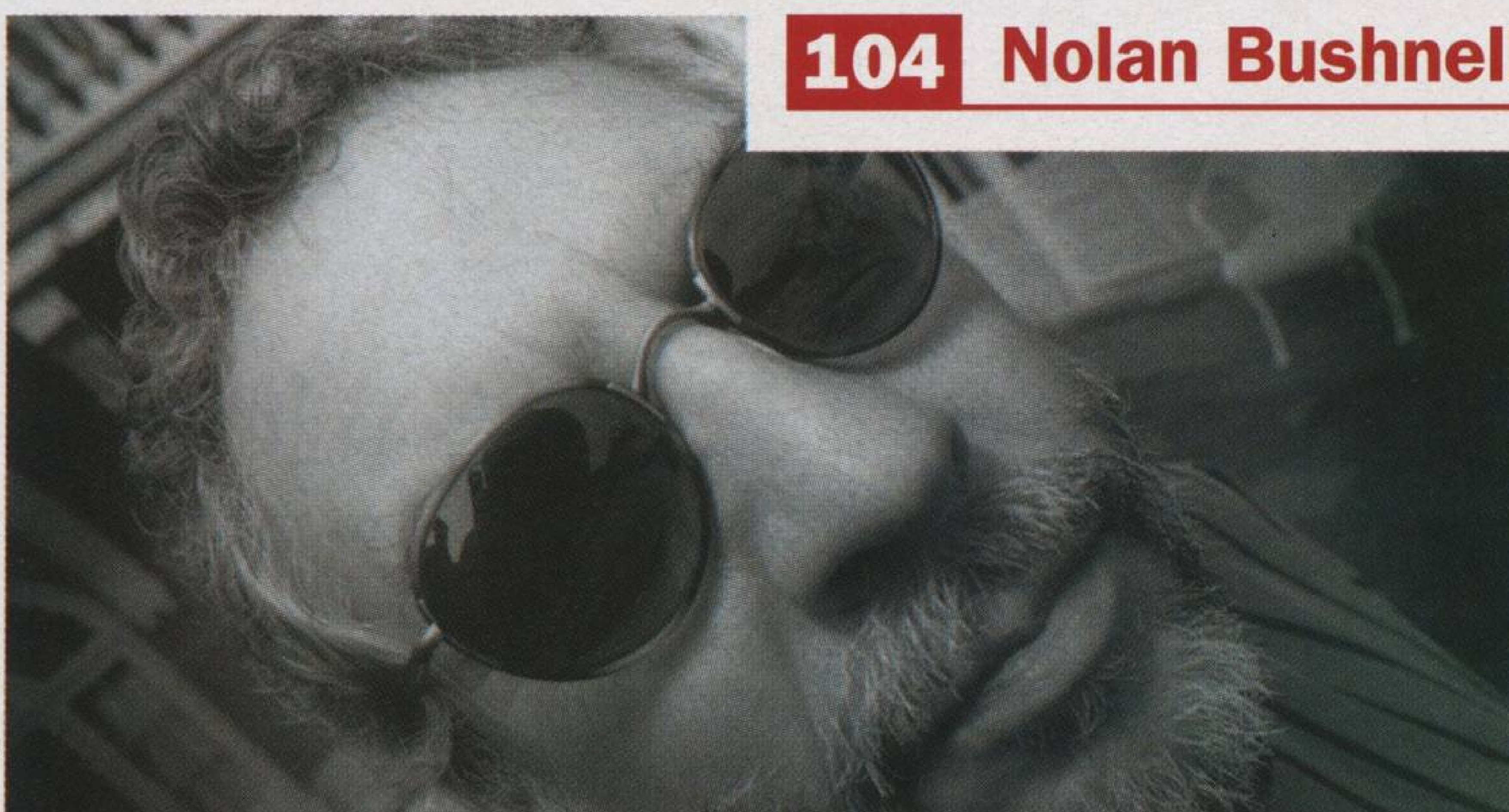

Fatal Fury 3 (left) and ***Astal***

71 Testscreen

Panzer Dragoon (left) and ***Lost Eden***

104 Nolan Bushnell



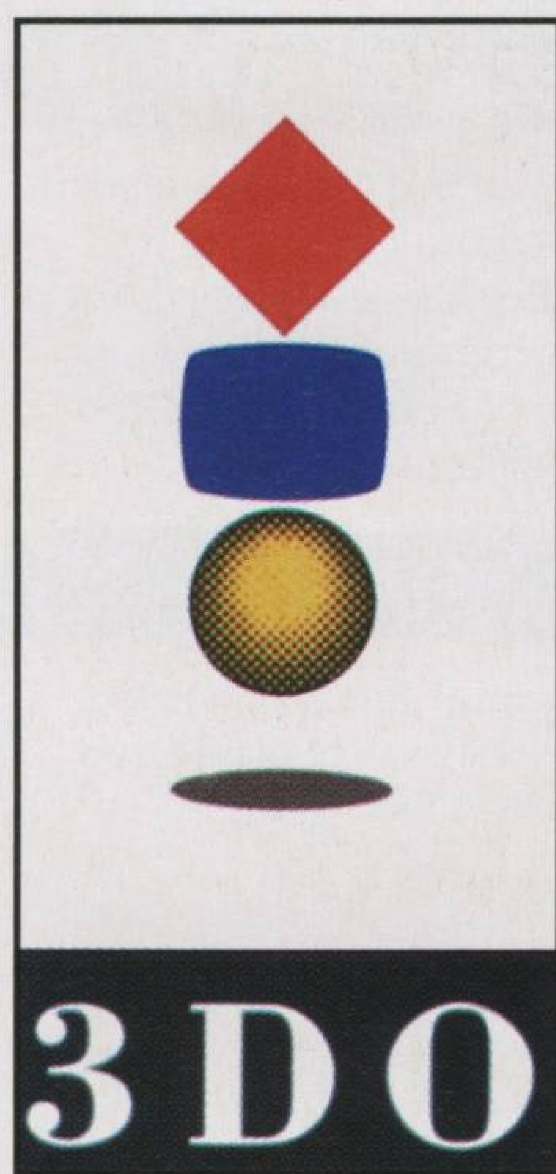
Photography: **Jude Edginton**

Cutting Edge

The latest **news** from the world of interactive entertainment

3DO tooling up for M2 showdown

3DO's upcoming hardware looks set to blow away the competition



Edge has uncovered new technical specifications for M2, the second-generation 3DO that CEO Trip Hawkins is counting on to wrest back the initiative from Sony and Sega. With the Saturn and PlayStation now firmly established in Japan and preparing to launch an assault on Europe later this year, M2 is being seen as 3DO's one-shot chance to re-establish itself at the top of the next-generation tree. The specs **Edge** has acquired indicate that M2 has indeed leapfrogged the PlayStation and Saturn and is now competing directly with the Ultra 64 on the 'next next' level of hardware.

The M2 project first surfaced in **Edge** 12 under the codename Bulldog. Many people thought the performance projections overambitious, but **Edge**'s sources have suggested that 3DO's initial claim of 3D proficiency five times greater than the PlayStation's was, if anything, conservative. According to the new data, the hardware shifts well over 1,000,000 plain and over 700,000 textured polygons per second (although the lack of a benchmark for polygon size and complexity means that these figures are open to interpretation).

With M2, Hawkins and his 3DO development team have placed the emphasis on producing sizzling realtime graphics. The system is being designed specifically to provide high-quality, high-speed 3D effects, including texture mapping, Gouraud shading, z-buffering and MIP mapping. These capabilities – which are far in excess of what today's machines can boast – are arguably even more revolutionary than M2's raw polygon count and give the system a real advantage over its competitors.



Matsushita's headquarters in Osaka, Japan. The world's largest electronics company is finalising M2's architecture with 3DO

The power to perform such visual gymnastics is provided by a redesigned version of the 66MHz PowerPC 602 chip (calculating an exceptional 133 MFLOPS) and a custom ASIC (application-specific integrated circuit), →



The PowerPC 602 chip used in M2 will be supplemented by a graphics ASIC

MIP mapping

MIP mapping is a maths-intensive technique used to improve the quality of 3D graphics.

Games like *Doom* scale bitmaps as the player approaches an object, thereby creating large, pixellated blocks. MIP mapping lakes these blocks and interpolates the 'gaps' between the original pixels to create a smoother display. MIP mapping is similar to anti-aliasing but offers more control over the results.

➔ cohabiting on the motherboard. Designed by Apple and Motorola engineers, the ASIC will handle the audio and video signals as well as the wealth of graphical effects. M2 is also reported to have access to an incredible ten co-processors.

To effectively exploit the potential of its silicon, 3DO has hiked M2's bus bandwidth (which governs the speed at which data is shunted around the machine and therefore affects the ultimate processing speed) from its original 400Mb per second to a more substantial 528Mb per second, making the machine perfectly suited to fast processing of large amounts of graphics data. This figure compares very favourably to the PlayStation's 132Mb/sec and even beats Nintendo's announced 500Mb/sec benchmark for its Ultra 64.

Add to this PCMCIA-style expansion slots and new built-in 2D routines designed to trounce the Saturn's sprite-handling capabilities and the M2 hardware looks formidable. The only possible gripe concerns its 'footprint' – the amount of data that the system routines and libraries take up in RAM. With a footprint of well over 400K, M2 will need lots of RAM to avoid being snubbed by memory-hungry developers.

Industry figures **Edge** spoke to were generally excited about M2's specs. 'M2 is great technology,' said one highly respected UK developer who preferred to remain anonymous. 'All the specs are exactly what I'd expect of a decent designer. They don't have that feeling of technical bullshit about them that you sometimes get.'

3DO M2 tech specs

CPU:	PowerPC 602 @ 66MHz (133 MFLOPS)
Co-processing:	• Graphics ASIC • 10 co-processors for graphics/audio
Graphics:	• Over 1,000,000 plain polygons/sec • 700,000 polygons/sec with affects (inc texture mapping, light sourcing, MIP mapping) • 100 million pixels/second throughput • Destination-based texture mapping • RLE compression/decompression • Pixel-level Gouraud shading and Alpha channel pixel averaging/anti-aliasing
Resolution:	640x480 in 24bit or 16bit colour 320x240 in 24bit or 16bit colour
Memory:	• 32Mbit SDRAM plus NVRAM on base system • 528Mb/second bus bandwidth
Sound:	DSP running at 66MHz, 2K cache
Options:	PCMCIA slot, MPEG 1 with multiple streams
Release:	• Upgrade cartridge for existing 3DO – Dec 1995 • New console including M2 technology – TBA
Price:	Upgrade cartridge $200 (£127) approx

As ever, the success of a hardware platform ultimately rests in the hands of developers. No matter how good the technology is, the public loses interest if top titles fail to appear regularly. First signs are good: a Studio 3DO demo recently shown to developers included a *Virtua Fighter*-style beat 'em up shifting characters composed of thousands of textured and shaded polygons in realtime. It was described by observers as 'very, very impressive'.

But there is still scepticism about 3DO's chances. One pundit observed: '3DO Mk1 carved the way for the new generation of machines and it solved everyone's development problems for CD-based and 32bit machines. Unfortunately, when the more powerful machines came along, programmers had no trouble porting their skills to the new platforms and developing their skills there. The whole development community's heads are reeling with the technology that's already out there. The galling fact for 3DO is that M2 may act as a training ground for the Saturn 2 and the PlayStation 2, which will then go on to reap the rewards again.'

Who is it?

After huge successes with coin-ops in the early '80s, this US videogame pioneer remained out of the limelight until late '94, when he teamed up with Nintendo to work on the Ultra 64

'All the specs are exactly what I'd expect of a decent designer. They don't have that feeling of technical bullshit about them that you sometimes get'

Of course, this kind of view is most likely to be heard from people outside the 3DO camp. But even 3DO loyalists are questioning M2's commercial viability. 'With specs like these I would expect it to be a costly piece of hardware,' one developer offers. Matsushita may have to stomach a significant loss if M2 is to meet its proposed price of $200.

Despite this apparent lack of faith, 3DO remains bullish. Rumours that Matsushita was pulling out of the 3DO consortium have been firmly quashed by Hawkins, who told **Edge**: 'I can tell you personally that Matsushita is helping us with some aspects of the engineering of M2. We are having weekly and often daily meetings with them to plan the manufacturing and introduction of their M2 product.' 3DO is also known to be talking to arcade firms about crossover M2 technology.

Although 3DO itself is reluctant to divulge any concrete details about M2, the sheer power of the system means that it should create a much bigger splash than 3DO Mk 1. 

Z-buffering

One of M2's strengths is its depth-buffering ability.

In a fast-moving 3D game like PlayStation *Ridge Racer*, every polygon has to be displayed on a single x-y plane (the screen). The impression of depth is conveyed by scaling polygons as they approach, and moving objects in front of one another – called 'clipping'.

Depth-buffering, or z-buffering, uses a dedicated processor routine to provide perfect 3D clipping. Consoles without a z-buffer – like the PlayStation – have to circumvent ugly visual artifacts by sub-dividing polygons (which increases the number of calculations and theoretically makes the program run slower), clipped 'manually' by software routines.

Ultra 64: a chink in Nintendo's armour

Edge discovers more about the best-kept secret in videogames

it is...
Eugene Jarvis, the programmer of Williams' *Defender* and *Robotron 2084*. Last year saw the release of the Nintendo/Williams joint venture, *Cruis'n USA*, to a decidedly mixed reception

Despite watertight security, the secrecy and ambiguity surrounding Nintendo's Ultra 64 is slowly starting to clear. It now seems that the machine, which boasts a custom MIPS R4200 CPU supported by multiple co-processsors, will cause severe ructions throughout the next-generation scene when it appears in late '95, as currently promised.

Edge has acquired preliminary specs that detail the speed of both U64's CPU and its custom graphics co-processor, and has also spoken to insiders who have seen early demonstrations on emulation hardware. One source enthused: 'From what I've seen, it's going to be a very, very powerful machine. If you imagine the Saturn as a one, and the PlayStation as a three, then I'd have to say the Ultra 64 is easily a ten.'



Namco's *Hornet-1* realtime combat simulator uses an Onyx Reality Engine² to generate its visuals

There are, however, numerous incongruities in the leaked information. The machine's claimed maximum screen resolution of 1024x768 (a familiar Onyx workstation figure), running in full 24bit colour, would require a RAM frame buffer of over 2Mb, whereas the Ultra 64 is blessed with just two megabytes of main RAM. It's also doubtful that the 1024x768 hi-res mode could be put to any practical use – only HDTV sets would be able to realistically cope with such a display, and HDTV technology is only available in Japan, in analogue format.


Onyx power: sadly not *F-Zero* running on the Ultra 64 but a realtime racing game, *Fantasy 500*, from IG pioneers Kubota Graphics

Secondly, the reported clock speed of 105.58MHz for the U64 RS4200 is at variance with the 80MHz speed of the standard R4200 (a 32bit chip with a 64bit bus and data pipeline). If Nintendo has increased the speed of the chip, it will undoubtedly add significantly to the price of the unit (which is still the souce of squabbles between Nintendo and SGI). Furthermore, the costs of including a multiple co-processor architecture in a console costing $250 look prohibitive.

Nintendo has recently been romancing potential 'dream team' developers with a selection of demos running on a customised high-end Silicon Graphics workstation. This continued dependence on SGI hardware, coupled with the fact that no-one (including confirmed members of the dream team) has yet received a target box, casts doubt upon the progress of the system. With a proper development platform still not in sight six to eight months before launch, either the development of the system has been held up or Nintendo's security is tighter than anyone could have imagined possible.


Nintendo's machine will come with anti-aliasing as standard – as seen in this MultiGen realtime demo

Edge takes a hike

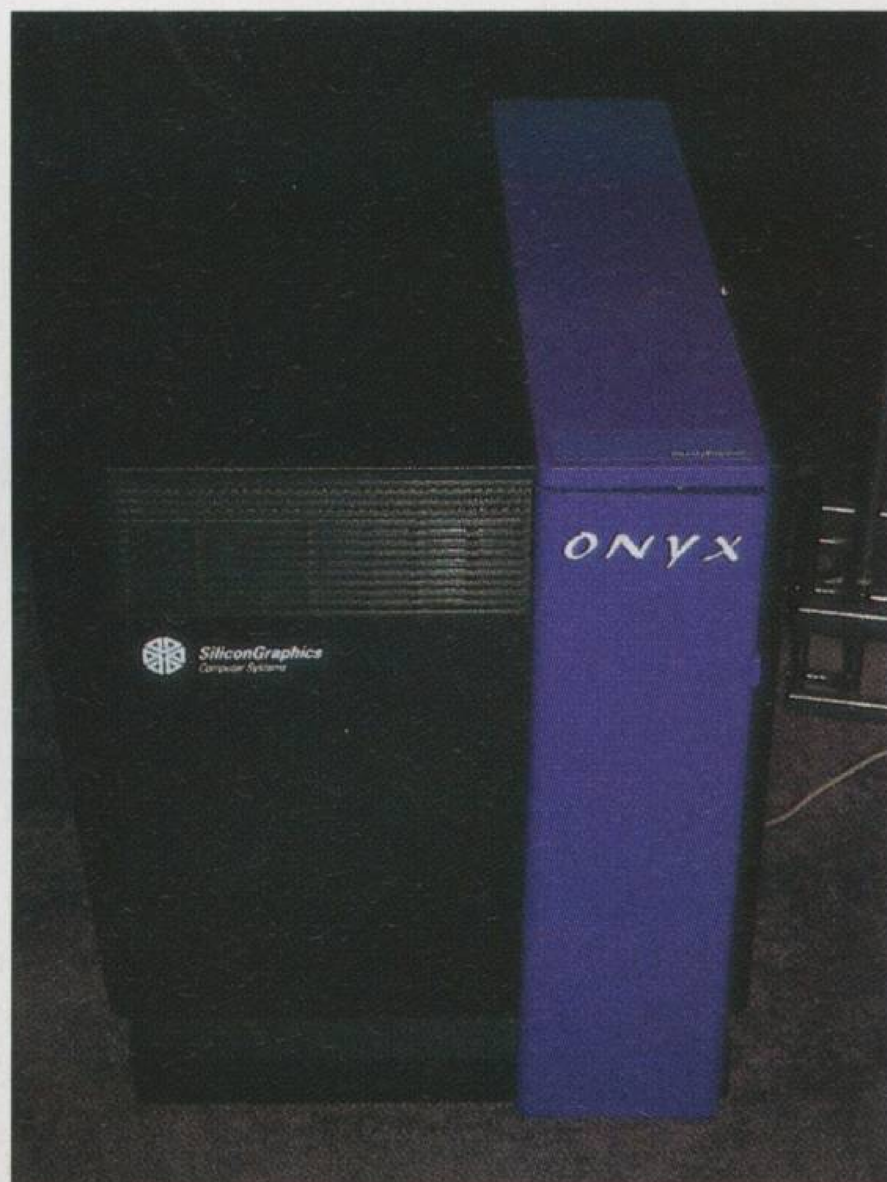
After 19 issues at £3, Edge has implemented an unavoidable price increase. From this issue onwards, the cover price will be £3.50.

The main reason for the increase is the rising cost of paper, which the magazine could not continue to absorb any longer. Edge uses high-quality paper stock and a decision was taken not to interfere with the look and feel of the magazine by changing to lower-grade stock.

Subscribers will, of course, continue to receive their unrivalled coverage of the interactive entertainment scene at the price they paid when they took out their sub.

Nintendo's Ultra line-up

The only potential advantage of Nintendo's decision to go for a cartridge rather than a CD machine is that developers will be forced to concentrate on game engines and playability rather than trying to fill CDs. This view is borne out by the company's own selection of software for the system. Games planned for release at launch are reported to include updates of *Starfox, Donkey Kong, Mario* and *Pilotwings.* Plus ça change...



In the absence of an Ultra 64 target box, Nintendo's developers have to get to grips with a Silicon Graphics Onyx

➔ The current development environment used by members of Nintendo's 'dream team' (Rare, DMA Design, Iguana, etc) takes a curious form. All work is undertaken on an Onyx using a software emulation window created by SGI and Rare. This turns off many of the Onyx's features, enabling preliminary Ultra 64 code to be developed. Such is Nintendo's concern about keeping the project under wraps that development partners are only signed up when have complied with the Japanese giant's stipulations about the security of their premises.

Perhaps the most ludicrous element of this whole charade is Nintendo's insistence that the first games developed for the Ultra 64 be no larger than 100 megabits before compression – a requirement that is causing considerable problems for eager programmers and designers. It's difficult to see how the unrivalled 3D capabilities and wide range of textures and effects apparently at the disposal of the Ultra 64 developer are going to be at all exploited within the 100-megabit limit.

'The current development hardware is way out of scope with the final spec, and there are so many things that simply can't be done within the 100-megabit limit'

'What they are switching off in the Onyx isn't enough,' claimed one developer. 'The current development hardware is way out of scope with the final spec, and there are so many things that simply can't be done because of the 100-megabit limit.'

Nintendo will have its work cut out convincing CD devotees that silicon is still a viable medium, especially given the well-documented profit differential between CDs and carts. 'If Nintendo has any objectivity it would have to be questioning the wisdom of saving a mere $30 on a CD mechanism to launch the Ultra 64 as a cartridge system,' claims a long-established champion of the CD cause.

It would be foolish to write off Nintendo on any count at this stage – the company has a unparalleled reputation for overcoming odds stacked heavily against it. But with potential Ultra 64 buyers currently falling for rival next-generation machines, Nintendo's approach could have serious consequences for the longterm future of its global business. Unless it steps up its Ultra 64 programme, the grim prediction made by a highly placed pundit **Edge** spoke to could prove true: 'I'm sure Nintendo will find a market for the Ultra 64, but I'm equally sure that its market share will also continue the steady decline that it has suffered for the last five years'.





With only 100 megabits to play with, developers could have a tough time converting Nintendo's coin-ops to the U64 with trimmings intact

Ultra 64 tech specs

CPU:	Custom 32bit RISC R4200 (clocked at 105.58MHz); 64bit bus
Graphics co-processing:	'Reality Immersion' graphics Processor (clocked at 80MHz); 24-bit DSP clocked at 50MHz)
Memory:	2Mb RAM. Rambus DRAM sub-system clocked at 500MHz. 500Mb/sec bandwidth
Graphics:	Texture mapping; morphing; scaling/rotation skewing; transparency; light-source shading
Colours:	24bit; 16.8 million
Video output:	Composite; S-Video; HDTV compatible
Resolution:	Up to 1024x768
Audio:	16bit stereo with 32 PCM channels @ 44.1KHz
Storage:	32Mbit EPROM and upwards
Software price:	$50
Release:	Third quarter '95

Ultra 64 delayed

Nintendo has announced that the Ultra 64 will not be released in the UK until at least spring '96. The revelation contradicts NOA marketing VP Peter Main's CES speech, in which he claimed that a worldwide release was due for autumn '95.

Of all UK console users, the two million SNES owners, who, after all, are the gamesplayers most likely to upgrade to the Ultra 64, have always suffered the most from frustrating delays to UK versions of both software and hardware, and this latest step is unlikely to endear Nintendo to them.

DVD plagued by double standards

Shades of VHS vs Betamax cloud the future of VideoCD's heir

The battle lines have been drawn over the future of digital video. As reported in **Edge** 18, Sony and Philips have already announced joint plans for a new high-capacity CD system that will make feature-length MPEG 2 recordings a viable proposition. Meanwhile, another consortium headed by Toshiba and Time Warner has revealed its own system. This means that two rival camps are now pitted against each other in a bid to establish their respective formats as the DV standard for the next century.

Philips and Sony demonstrated their new Digital Video Disc (DVD) system at the Winter Consumer Electronics Show in Las Vegas in April. It uses a single-sided 5" CD which is able to store an unbroken feature-length movie of LaserDisc picture quality with multi-channel surround sound. But the two companies failed to demonstrate an important extra feature developed by 3M: by making two separate recordings at different depths on the same side of the disc, separated by a semi-reflective layer (like a two-way mirror), the playing time can be doubled from 135 minutes to 270 minutes.

The rival Toshiba/Time Warner system has an even longer playing time (142 minutes), which it doubles by using a double-sided disc. This is made like a miniature LaserDisc by pressing two half-thickness discs and then gluing them together.

At the press launch in Hollywood in late January, Toshiba and Time Warner proudly announced that they had won the backing of Panasonic, along with Hitachi, Pioneer, and Thomson of France. Matsushita (Panasonic/Technics) had been close to backing the Philips/Sony DVD system, but pulled out at the last minute after heavy lobbying from Time Warner. Company chiefs promised that Toshiba DVD players would be on the market by the first half of 1996 at prices of around $500,

→



Whichever camp wins the digital video format wars, Philips' current CD-i standard will be rendered obsolete in terms of video playback



While MPEG 2 is destined to become the new CD standard for home movies, MPEG 1 will meet the requirements of games platforms like the CD-i (*The 7th Guest* above)

Glossary

VideoCD: digital video version of the existing CD and CD-ROM, with pictures coded to the White Book standard using MPEG 1 compression and a fixed data rate of just under 1.5 Mb/sec. Around an hour of VHS or slightly better-quality video can be fitted onto a single side.

Digital Video Disc (no longer called HDCD to avoid confusion with a hi-fi tweak to the ordinary audio CD): movie or multimedia disc which uses smaller pits, MPEG 2 compression and a variable bit rate of between 1Mb/sec and 10Mb/sec. Two hours of broadcast-quality video and up to five gigabytes of data can be recorded on a single side. Capacity doubled either by recording two tracks on a single side (Philips/Sony system) or by sandwiching two sides like a miniature digital version of an analogue LaserDisc (Toshiba system). Uses red laser for readout (not infra-red as in current CD drives or blue as promised for the more distant future).

Data stream

Internet growth during third quarter 1994: **21%**
Projected number of Internet users by 1999: **100-300 million**
Countries with fastest-growing Internet usage: **Argentina, Iran and Peru**
Revenue generated by PC sales in 1994: **£5.1 billion**
Revenue generated by colour TV sales in 1994: **£4.7 billion**
Number of excess cartridges Sony is offloading to retailers at £8.50 each: **1 million**
Number of software patents registered in US: **14,000**
Number of calls per day Microsoft expects when *Windows 95* is released: **30,000**
Cost of Street Fighter film: **£25 million**
Number of copies of Mega Drive *FIFA Soccer* sold to date: **500,000**
Number of hours average US resident spent watching TV in 1994: **1,529**
Value of pirated software in 1994: **£5 billion+**
Length of international phone calls made worldwide in 1988: **23 billion minutes**
Length of international phone calls made worldwide in 1993: **43 billion minutes**
Number of cups of tea drunk in the US in 1994: **8 billion**
Number of cups of tea drunk in the UK in 1994: **60 billion**
Fifth best-selling CD-ROM from the US Government Printing Office in 1993: **Toxic Chemical Inventory**
Size of Sony Computer Entertainment's ECTS stand: **14,000 metres²**
Number of Jaguars sold in Europe to date: **60,000**
Number of Jaguars sold in the UK to date: **30,000**
Best-selling underground comic in the US in 1994: **Horny Biker Sluts**

➔ with double-sided movie discs at prices similar to audio CDs.

Sony and Philips went quiet while they evaluated the Toshiba technology. Trade observers expected capitulation. But in late February both Philips and Sony publicly rejected the idea of a double-sided disc, while Toshiba reaffirmed its commitment to the glue sandwich concept.

Philips and Sony also changed tack, laying more emphasis on the 3M option of doubling capacity by pressing two different recordings into one side and talking more about using the new disc for PC, games and multimedia storage and less about Hollywood movies.



The situation is now fast becoming a re-run of the PR wars of the '70s and '80s between the rival VHS and Betamax home video systems, and the early '90s battle between the Sky and BSB satellite rivals. In each case important technical issues were submerged under a wave of hype.

Toshiba has delegated Thomson to disseminate press information. But when asked the simple question, 'Where will the label go on Toshiba's double-sided CD?', Thomson could say only: 'We are not disc manufacturers.' This is unlikely to inspire confidence in the depth of Thomson's technical evaluation of the system it is promoting as a new world standard.

In the UK, Sony has said nothing, and faith in the Sony/Philips option is at a similarly low level. But Philips' Eindhoven lab recently demonstrated that the 3M concept really does work. The servo-control system for the readout laser locks onto either track and stays locked until switched to the next layer. The switch takes only a few thousandths of a second, which is far faster than turning over a double-sided disc or moving the readout laser from one side to the other.

Philips has also raised some serious technical questions about Toshiba's blueprint. Toshiba achieves higher capacity than Philips (five gigabytes per side compared to 3.7 gigabytes per recording layer) by making the data pits smaller. The numbers look impressive, but smaller pits are harder to master, harder to press and susceptible to corruption by users' fingerprints. Fingerprinting could drive Toshiba's system into caddyland. And this restricts the use of juke box storage units.

An ultra-violet laser is also needed to cut master discs. Pressing plants have to re-equip, too, because the two halves of the Toshiba disc are half-thickness, necessitating different moulds and plastics. And smaller pits need a smaller laser spot for readout. Both systems use the same red laser with shorter wavelength than the infra-red lasers used to read today's CDs and CD-ROMs, but Toshiba uses a lens with a very high NA (numerical aperture) for tighter focus, and a non-flat disc is more likely to upset this tight focus. This is probably the real reason why Toshiba uses half-thickness pressings – focus tolerances are made easier by a thin pressing. But the half-thickness pressing lacks strength, which is the main reason for gluing two together – doubling capacity is a by-product.

The snag is that a lens designed to play half-thickness pressings cannot also play back full-thickness ones, and putting two lenses into the same player creates servo control problems. If and when Toshiba demonstrates high-density playback, the key issue will be how easily and cheaply the same player can cope with today's CDs and CD-ROMs. **E**



The move towards high-density MPEG 2 discs should enable VideoCD to finally emerge from the shadow of LaserDisc (above), the current state of the art for home video

What is it?

Arguably the first games hardware to attain mass-scale must-have status. Such was its desirability that at its launch in Japan a yakuza ring was rumoured to be planning a raid on the first shipments

MMC slams S&N duopoly

The long-awaited Monopoly and Mergers Commission (MMC) report on the games industry has found Sega and Nintendo 'guilty of monopolistic practices with adverse effects on the supply and availability of videogames'.

The MMC goes on to 'suggest' that Sega and Nintendo change their pricing policies and licensing requirements, and threatens price controls if no action is taken.

The report comes at a bad time for both companies. Sega is already facing legal action from ex-cartridge rental licensees over its refusal to return fees to retailers. And Nintendo's domination of the Japanese market is being seriously challenged for the first time by Sega and Sony.

Sega has voiced 'disappointment' at the MMC report and stated that the software games industry 'is a great deal more open than the MMC appears to believe'.

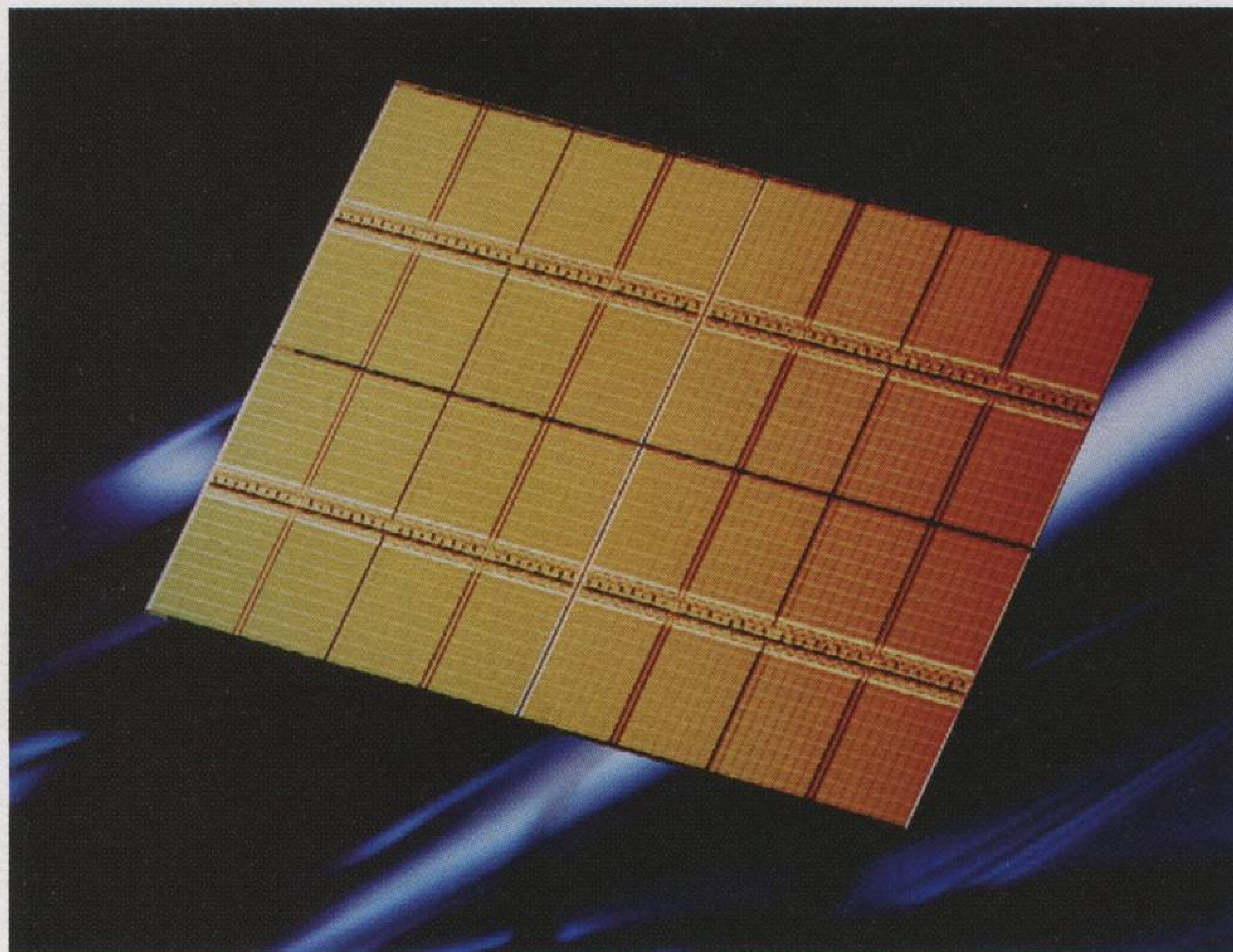
NEC performs feat of memory

RAM technology has made a huge advance with a new chip from NEC

it is...
The Super Famicom, which made far bigger waves in 1990 than the PlayStation and Saturn could ever hope for today. Retailers even resorted to instore lotteries when machine stocks began to run low

Japanese technology giant NEC has succeeded in producing the world's largest-capacity DRAM chip. Called the Gigachip, it can store a massive 1 gigabit (128Mb) of information – enough to hold four hours of CD-quality sound or 15 minutes of MPEG 1 video footage. Data stored on the chip can be accessed at 400 megabytes per second, much faster than the maximum 600K/sec boasted by quad-speed CD-ROM drives.

Although NEC admits that the chip will not be ready for mainstream use until the end of the century, it is forging ahead to make the technology available for testing and sampling by 1998. The company is assuming that the memory demands of hardware and software will continue to rise at a rate that will enable the chip's potential to be fully exploited by the time it is onsale.

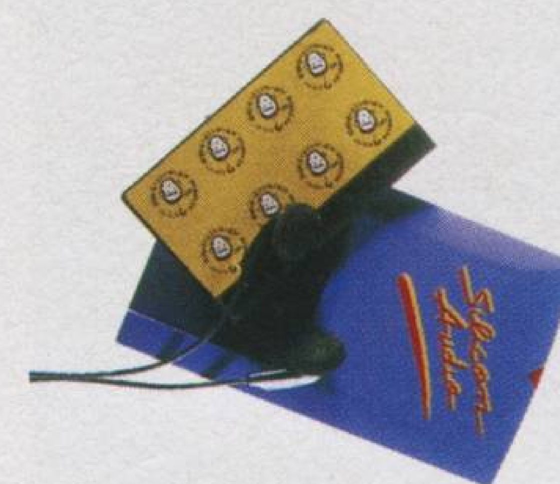


NEC's Gigachip, the most complex chip ever made, contains over a billion capacitors and can store up to four hours of CD-quality sound

The Gigachip's huge capacity is achieved by reducing the size of the capacitors in the silicon wafer without increasing production irregularities (and hence unreliability). To manufacture the chip, NEC is using new tools based on 0.25μ CMOS (complementary metal oxide semiconductor) technology which allowed unprecedented microscopic precision. This is in addition to other techniques which have been developed over recent years to improve manufacturing reliability and therefore capacity. The result is that the Gigachip is the most complex chip ever produced, containing 1.1 billion transistors and 1.1 billion capacitors (in comparison, the highly complex GLINT graphics chip contains three million transistors).

The Gigachip is just one product in NEC's 'millennium line' of new technology expected to become viable by the beginning of the 21st century. A parallel development is the provisionally titled Silicon Audio, a credit-card-sized device which is designed to provide a chip-based alternative to audio CDs. The system uses flash-memory silicon to hold up to three hours of music on a 256Mbit card, with data compressed using a routine called MPEG/Audio Layer II. The prototype weighs 123g without its four NiH batteries and 217g with them (each set lasts 4.5 hours).

Because there are no moving parts, Silicon Audio doesn't jump or skip, and it should soon be able to make use of new technology which will allow a limitless number of re-recordings. It therefore offers distinct advantages over current CD technology. However, NEC is emphasising that Silicon Audio won't be in a position to challenge the conventional audio CD for some time yet – it is unlikely to be released before 1999.



NEC's new Silicon Audio system could theoretically make the CD redundant by 2005

NEC Gigachip tech specs

Process technology:	0.25μ CMOS
Lithography:	KeF Excimer laser plus i-line
Memory cell:	0.6μ x 0.9μ (0.54μ²)
Chip size:	25.84mm x 36.24mm (936mm²)
Frequency:	11MHz
Data transfer rate:	400Mb/sec
Operating current:	68mA @ 100MHz
Bit configuration:	x32
Power voltage:	2.0-2.5v
Power consumption:	138mW

Microsoft snaps up 3D hotshot

Home-grown 3D graphics specialist RenderMorphics is now part of the Microsoft empire

Microsoft

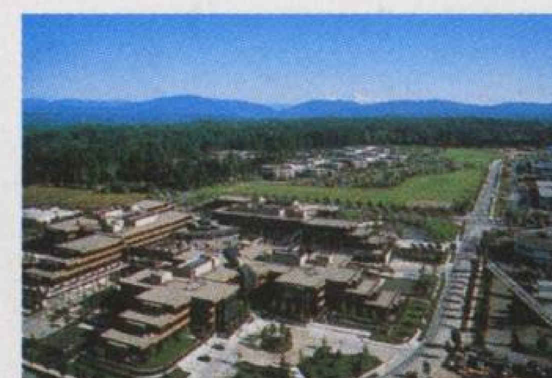
Microsoft Corporation has added RenderMorphics to its stable of specialist graphics developers. RenderMorphics is the company behind the respected 3D API *Reality Lab*, one of a trio of new-age games programming tools which greatly speed up development time and enhance the graphical sophistication of the end product.

Microsoft's acquisition of the firm not only confirms its commitment to realtime 3D but adds another piece to a potentially fascinating 'future of the PC' jigsaw. It has been known for some time that RenderMorphics is collaborating closely with other major players in the industry, and factions are now coalescing in the search for an elusive (and enormously lucrative) PC graphics standard.

Microsoft has already formed an alliance with the world's largest soundcard manufacturer, Singapore-based Creative Labs, endorsing its Soundblaster card as the standard for *Windows 95*. Creative has in turn established a partnership with GLINT chip manufacturer 3Dlabs to provide a games card for the PC.

And RenderMorphics and Creative have signed a non-exclusive deal giving Creative access to RenderMorphics' graphics libraries. RenderMorphics is also working with Sony to provide the graphics libraries for the PlayStation, and now Sony is involved in negotiations with Microsoft itself over set-top boxes and the DVD standard.

A PC standard has been an unattainable dream for some time, but given Microsoft's unrivalled marketing muscle and product support, any group of companies working together under its banner has a genuine chance of actually making it happen.



RenderMorphics has now upped sticks to Microsoft's HQ (above) in Seattle, Washington

Pioneer leads the way with **Mac OS**

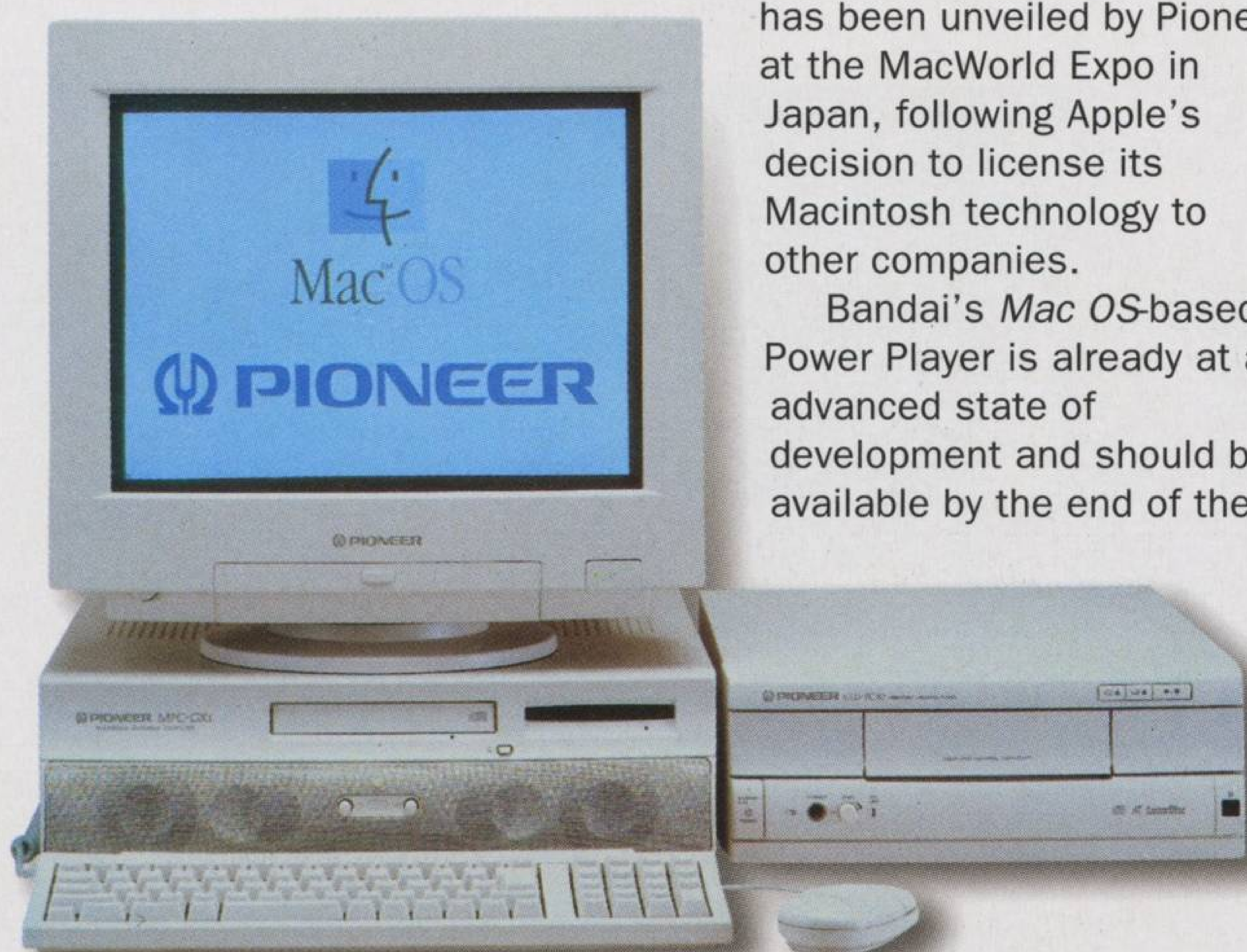
Apple's new open-licensing policy has already borne fruit

The first full-spec thirdparty computer to incorporate the Macintosh operating system has been unveiled by Pioneer at the MacWorld Expo in Japan, following Apple's decision to license its Macintosh technology to other companies.

Bandai's *Mac OS*-based Power Player is already at an advanced state of development and should be available by the end of the year (see **Edge** 18/19). However, the Power Player is targeted specifically at the leisure market, while Pioneer's intention is to combine its proven audiovisual expertise with Apple's easy-to-use operating system in an assault on the business sector.

The machine is based on the PowerPC 601 chip also used in Apple-badged Power Macs and will feature the fastest CD-ROM drive currently available commercially, Pioneer's 4.4-speed system. There's also a surprise gift for LaserDisc fans, as Pioneer will offer its high-quality CLD (Compact and LaserDisc) player as a built-in option.

These specs reveal the Pioneer Mac to be an impressively powerful and versatile system. Although its price is still unconfirmed, it should give Apple's newly orphaned *Mac OS* a good chance of survival in an increasingly tough world.



Pioneer's new *Mac OS*-based system (above left) will reap the benefit of the company's expertise with LaserDisc technology (above right)



Primary Image

Due to deadline chaos, Edge inadvertently allowed an image generated by VR firm Primary Image to creep into a feature about the company's commercial rival, Division. Edge would like to make it clear that the picture in the centre of page 53, issue 19, was not in fact produced by Division.

Instead, the picture was a product of Primary Image's own model P10 textured image generator, a scalable high-end realtime VR system for the PC. The board offers anti-aliasing, MIP mapping and up to 400,000 polygons per second in true colour. Primary Image claims that its technology is the first to offer workstation performance on a PC.

Primary Image can be contacted on: 0181 339 9669 (tel); 0181 339 9091 (fax).

Jaguar plugs into the **CD** revolution

Atari's delayed CD drive for the Jaguar finally gets ready to ship







The Jaguar CD's software cinepak is surprisingly effective, although it's no surprise that pixellation rears its head when images move at speed

The Jaguar CD add-on, originally intended to be released in 1994, has now been scheduled for launch in April this year. It will retail at £150 and be bundled with one game (exactly which one is undecided).

The peripheral is a straightforward plug-in device. As well as being able to play Jaguar CD games, it can be used for conventional audio CDs – in conjunction with the latest incarnation of Jeff Minter's Colourspace project, Virtual Light Machine.

An all-in-one Jaguar CD unit will be released towards the end of the year. It will find itself in direct competition with the Saturn and PlayStation, which converge on the UK market at around the same time.

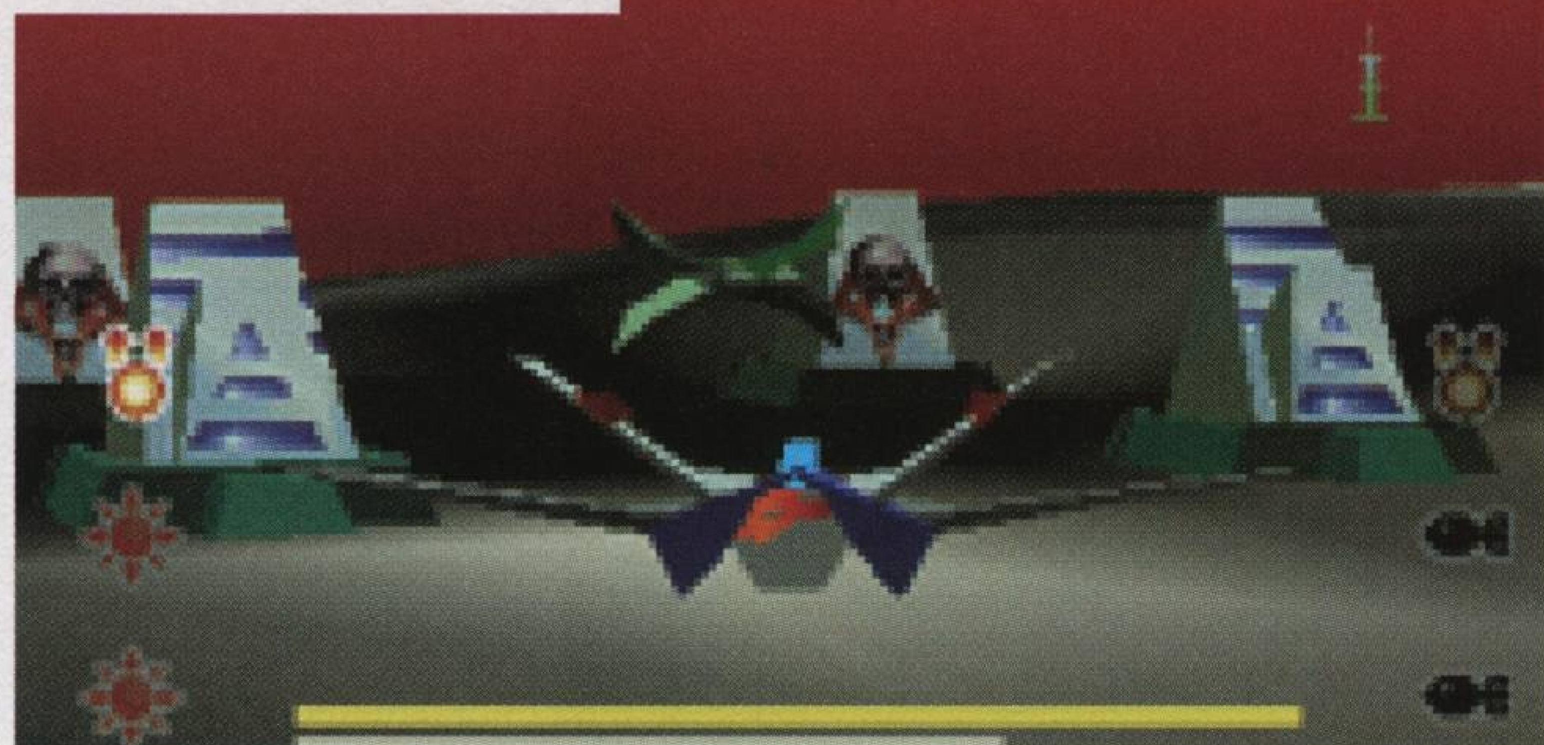
Of course, it will be software that will determine the system's success or otherwise, and the initial line-up includes few titles of note. The one most eagerly awaited by Jaguar owners is undoubtedly *Battlemorph*, the sequel to ATD's Gouraud-shaded shoot 'em up, *Cybermorph*. The gameplay runs along similar lines to the original but there are various additions, including impressive new underwater sections. (**Edge** will have a full preview of the game next month.)

Prolific Jaguar developer Rebellion has stated that it has no CD-specific projects in the pipeline, but a number of its cartridge titles are due to get the CD treatment. The most promising of these is the *Dungeon Master*-ish *Legions Of The Undead* (originally seen in **Edge** 4 under the working title *Dungeon)*. Based on a graphics engine best described as a cross between →



Cost was obviously a prime consideration during the development of the Jag CD – the unit has a slightly flimsy feel





Atari has yet to confirm it, but *Battlemorph* (above) is the most likely candidate to appear packaged with the unit. *Jack Nicklaus' Cyber Golf* (inset) is the first of a number of sports titles planned for the system

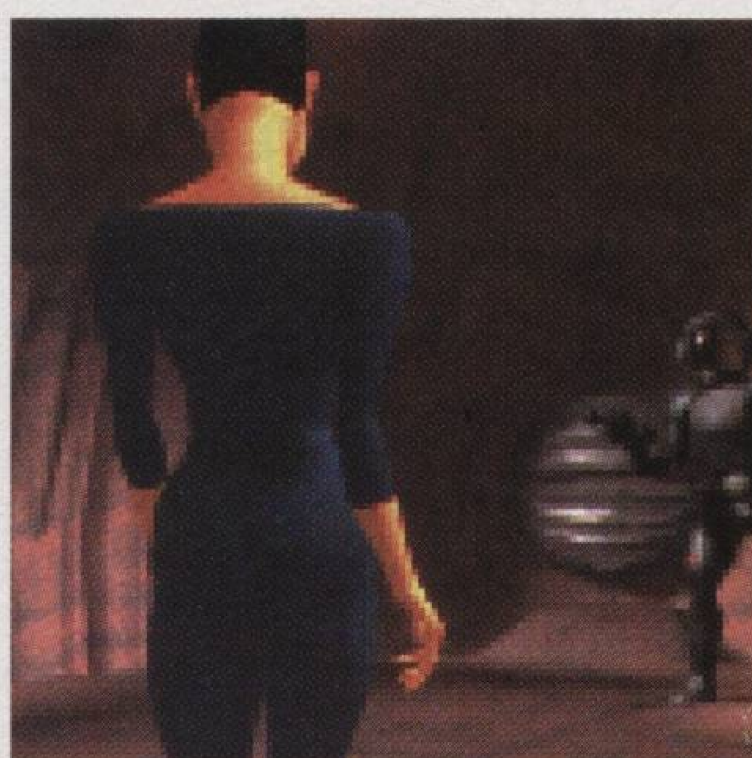


Looking suspiciously like Elite's dull PC and 3DO title *Virtuoso* is *Chaos Agenda*. Atari will be hoping to match its digitised characters with equally sharp gameplay











Set to appear on Jaguar CD: *Demolition Man* (top); *Blue Lightning* (main); and Argonaut's conversion of *Creature Shock* (above)



Readysoft's *Dragon's Lair* series looks set to hit every CD system ever made

What is it?

It was arguably the first piece of hardware to attain mass must-have status. Such was its desirability at launch that a Japanese yakuza ring was rumoured to be planning a raid on the first shipments

Virtual Light Machine

When an audio CD is inserted into the Jaguar drive, the machine automatically switches to VLM mode, an onboard software routine written by *Tempest 2000* programmer Jeff Minter with Dr Ian Bennett.

A standard CD player front-end is displayed while coloured, music-sensitive patterns swirl, mutate and blend in the background.

The overall effect is similar to Panasonic's FZ-1 3DO music-playing routine, although the VLM allows the user to choose between nine different patterns and is more visually responsive.

→ *Alien Vs Predator* and *Doom*, it will feature 'algorithmically animated textures' and offer the ability to look up and down. The cartridge version will be finished shortly and is likely to headline at Atari's ECTS stand.

However, probably the most exciting development for the Jaguar CD (**Edge** is certainly looking forward to it) is the proposed conversion of *Defender 2000*, a project that came about when **Jeff Minter** approached Atari and suggested that he convert one of his all-time favourite games to the Jaguar. Like *Tempest 2000*, his previous tribute to a classic arcade title, it will incorporate both a straight emulation of the Williams original and an enhanced 'plus' version. Fully coloured backdrops (the original's backgrounds consisted of simple vector graphics), a CD soundtrack and AI-endowed multiples are all promised for the new game. Minter is currently putting the finishing touches to the core gameplay.





'It's looking more and more like this is gonna be on CD,' enthuses a typically exuberant Minter. 'I'd kinda like to do a historical section on there as well, because we get so much room on the CD – an interview with Eugene Jarvis [the programmer of the original arcade game] maybe, and other historical data about *Defender*.'

Jaguar CD tech specs

Data transfer:	Double-speed drive – 352K/second sustained data rate
CD capacity:	790 megabytes (non-ISO 9660 custom Atari format)
CD management:	Custom 'Butch' processor handles system chores and buffers data
Save RAM:	VLM saves last setting without expansion. Flash RAM cartridge (1 Mbit) for multiple saves to be available separately
Video standard:	VideoCD (only with optional MPEG cartridge)
Release:	April 1995
Price:	£150

Jaguar CD games in development

Barkley: Shut Up and Jam! Accolade
Battlechess Interplay
Battlemorph: Cybermorph 2 Atari
B.I.O.S. Fear All Systems Go
Blue Lightning Atari
Braindead 13 Readysoft
Brett Hull Hockey Accolade
Chaos Agenda Atari
Creature Shock Virgin Interactive
Crime Patrol American Laser Games
Demolition Man Virgin Interactive
Dracula The Undead Atari
Dragon's Lair Readysoft
Dragon's Lair II Readysoft
Dreadnought Atari
Evidence Microids
Freelancer 2120 Imagitec
Highlander Atari
Horrorscope V-Reel Productions
Hosenose And Booger All Systems Go
Isle Of The Dead Rainmaker Software
Jack Nicklaus' Cyber Golf Accolade
Legions Of The Undead Rebellion Software
Little Divil Gremlin Interactive
Lobo Ocean
Primal Rage Time Warner Interactive
Mad Dog McCree American Laser Games
Mortal Kombat III Williams
The Outpost Atari
Return To Zork Activision
Robinson's Requiem Silmarils
Skyhammer Rebellion
Space Ace Readysoft
Soul Star Core Design
Space Pirates Atari
Starnet Virtual Xperience
Star Trek: NG Microprose
Theme Park Bullfrog
The Realm Fighters High Voltage
Varuna's Forces Accent Media

AOU: coin-op houses unveil '95 line-up

Arcade companies show their wares at Japan's premier coin-op event

it is...

Albuquerque, New Mexico. In 1975, MITS (Model Instrumentation Telemetry Systems) founder Ed Roberts created the Altair after realising the potential of microprocessors outside mainframes

With *Virtua Fighter 2* fever slowly dissipating in Japan, visitors to the Amusement Operators' Union show in Tokyo were desperately looking for the next big thing.

And, perhaps predictably, it was another beat 'em up that drew the biggest crowds. Capcom's follow-up to last year's *Vampire Hunter – Vampire Hunters: Darkstalkers' Revenge* – was so popular that its stand was swamped from the moment the doors of the show were flung open. The sequel features two new characters and options to allow beginners an easier time of it but remains largely unchanged elsewhere. It seems that the classic *SFII* gameplay can still hold its own in Japan.

Capcom's other new titles were sequels. *Cyber Bot: Fullmetal Madness*, weighing in at around 300 megabits, is the successor to 1994's *Powered Gear*, but its robotic fighters proved only a mild draw with showgoers. Surprisingly, the *Street Fighter* series also gained a new addition, called *Street Fighter Zero*. Its graphical style is now more akin to *Darkstalkers* than previous *SFII* incarnations, with new backdrops and several extra characters, including a mohican-crested punk called Birdie.

It was left to the likes of Sega to offer an original game, namely the next title in its *Virtua* series, the Model 2-based *Virtua Striker*, inspired by the 2002 World Cup which Japan is bidding to stage. Everything in the gameworld – including players, posts and stadium – is made up of texture-mapped polygons, and multiple views can, of course, be selected. *Virtua Striker* offers a typically Japanese approach to the sport: it's fast, dynamic and wonderfully over the top. The Japanese interest in football in general has waned recently, though, and Sega found itself receiving less attention than it deserved.

A finished version of *Sega Rally* finally made its public debut and had the desired effect on audiences. Now →



1995's Amusement Operators' Union show offered few real surprises to the thousands of delegates that swept through its vast main hall







Although the surface detail in *Air Combat 22* is gorgeous (left), most of the game is spent dogfighting high above the ground (right)







Japanese gamers queued for hours to play Capcom's *Vampire Hunters* (right)



Sega's Model 2 technology is expanding into all areas, as *Virtua Striker* shows. Although the game played as well as other Japanese examples of the genre, AOU visitors gave it a lukewarm welcome



The high level of detail in *Virtua Soccer* extends even to the flesh on players' limbs







Two ST-V titles debuted at AOU, both one-on-one beat 'em ups: Sega's *Golden Axe: The Duel* (middle) and *Suigoben* from Data East (above)

PowerPC for Model 3?

The successor to Model 2 – the custom board behind *Daytona USA* and *Virtua Fighter 2* – is currently in development at Sega's Japanese hardware division. It's thought that Model 3 uses Motorola's PowerPC microprocessor in a parallel environment similar to Tao Systems' *Spyfish* arcade game (see Edge 19).

However, don't expect to see it just yet. Sega's in-house commitment to Saturn development has hampered progress on the Model 3 board and all available resources are being directed at Saturn conversions of *Daytona USA*, *Virtua Fighter 2* and *Virtua Cop*.

Sega's coin-op factory won't be short of releases, though: it already has plans to unveil *Virtua Cop 2* at the JAMMA show in August, and *Virtua Fighter 3* is also at the planning stage for release in the latter half of 1996.

AM2 has another polygon beat 'em up in development, based loosely on *Virtua Fighter* but with characters donning armour and wielding some heavy-duty weaponry.

→ with four cars and four levels (desert, mountain, forest and lakeside), the game offers increased roadside detail and a soundtrack sampled from real engines. While Sega expects the machine to perform well in Japan, it is more concerned with achieving a rapturous response in the West, where the theme is more established.

Rail Chase 2, the sequel to last year's big Japanese hit, was also on show. Its presentation is completely different to that of the original – scaled sprites and backgrounds give way to texture-mapped Model 2 visuals – and the gameplay has also been updated to allow the player more control. It seems certain to achieve at least as much success as its predecessor.

Sega's final 3D offering was *Dennoo Senki Net Merc* (literally *Electric Brain War Machine*), which features a head-mounted display device (similar to those seen in Sega's VR-1 theme park attractions) and uses a Model 1 board to generate its game environment. The simplistic shooting action plays well enough, but the display quality is poor and the graphics signally failed to impress an audience hungry for texture-mapped polygons.

But polygons aplenty were to be found on Namco's stand, where *Air Combat System 22*, *Cyber Cycles* and *Alpine Racer* were located. In the same way that *Cybersled* received a texture-mapped paint job and became *Cyber Commando*, the latest *Air Combat* has few actual gameplay improvements but boasts updated ground detail and enhanced aircraft. And to show off the

Continued next page





Sega Rally's ground detail looks spartan in static shots, but you have to see the beast in motion to appreciate just how enticing the 3D environments are. An enhanced Model 2 delivers the goods





Japanese gamers have been eagerly awaiting Namco's successor to *Ridge Racer* and they found it in the multiplayer motorbiking *Cyber Cycles* (left and above)





Namco's PCB titles, *Outfoxies* (top) and the *Track And Field*-inspired *Mach Breakers* (above)

Continued

new graphics, Namco has given the game more of a close-combat feel – you and your opponents often share the same airspace, and the result is a more exciting match-up.

Cyber Cycles is a futuristic bike-racing game which is similar to *Suzuka 8 Hours* to control – you sit astride a small bike and lean into corners. Its backgrounds are reminiscent of *Ridge Racer* (but with greater detail and a richer colour palette) and various views are selectable, à la *Daytona USA*. The finished game will certainly garner a following among the growing ranks of driving-game freaks.

Namco further demonstrated its dedication to original cabinets with *Alpine Racer*, a skiing simulator for those with enough energy to manhandle its machine-mounted ski poles and foot mountings. Its slalom courses are presented in breathtaking 3D but **Edge** found the game too limited for extensive play: the novelty of the control method means that it's not interactive enough to convey the thrills demanded by the concept.

All three of these titles were displayed in a standard System 22 format, although Namco is currently engaged in reprogramming them to make use of its newly developed board, Super System 22.

AOU wasn't all about giving new 3D games an airing, though. Namco also showed *Outfoxies*, a platform shoot 'em up with strong overtones of one of its earlier coin-op successes, *Rolling Thunder*. With titles like this, Namco is covering all bases and showing that the still-flourishing PCB market is an important part of its business strategy.

Konami and Taito have, of course, always excelled in this area, and their products at AOU reflected their continuing commitment to it. Konami's *Pop 'n' Twinbee* made yet another appearance in coin-op form but had little new to offer. For its part, Taito showed *Elevator Action Returns* – yet another sequel to an aged original – but succumbed to the temptation of 3D and gave centre stage to *Amazia 3D*. Making use of technology developed last year, *Amazia* fails to attain Model 2 or System 22 standards but bodes well for Taito's future 3D work – hopefully, the tired *Operation Wolf*-derived sprite-expanding engine will now be dropped in favour of polygons. **E**

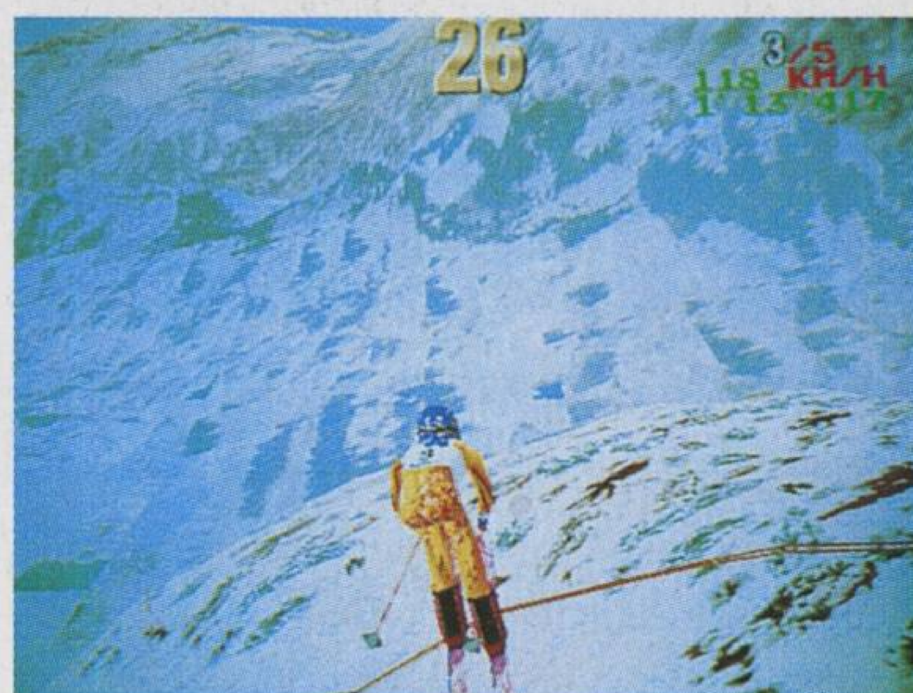


Namco's innovative *Alpine Racer* looks more like a piece of gym exercise equipment than a coin-op, but it works





Sega's *Rail Chase 2* (top) uses a true 3D display. Taito's *Amazia 3D* shoot 'em up (above)





Alpine Racer's polygon backdrops give the game incredible over-the-shoulder appeal. Sadly, the gameplay itself fails to quite live up to the System 22 exterior sheen

Saturn bandwagon gathers speed

A new Hitachi Saturn is due to join the Sega and JVC models already available in Japan

Hitachi has announced that it will launch its Saturn-compatible machine, the Hi-Saturn, in Japan on April 1. Advertised as a multimedia player, the unit will be able to run standard Saturn software as well as handle PhotoCD and VideoCD formats (Sega itself isn't releasing PhotoCD or VideoCD expansion modules for the standard Saturn until later in 1995).



© Famitsu Ascii Corp

The HI-Saturn looks similar to Sega's original machine but will be marketed as a multimedia system rather than a games console

Priced at ¥64,800 (£440), the console will be supported by two Hitachi-branded peripherals: a ¥14,800 karaoke machine (an almost essential component of a Japanese multimedia setup); and a 20" television (¥90,000) with specific connectors for the Hi-Saturn and karaoke module.

Hitachi's support is extremely important to Sega. With JVC's V-Saturn already installed in many Japanese homes, there are now two extra models – and the independent marketing muscle that goes with them – to push the standard (something that took 3DO, with Goldstar and Sanyo, considerably longer to achieve).

Meanwhile, back on these shores, Sega has unveiled full details of the European Saturn system and peripherals some months earlier than was originally planned. With the PlayStation currently enjoying a high level of attention among UK gamers, Sega has apparently decided that it needs to raise its own profile as the next-generation battle prepares to move into its second phase, which takes place on British soil.

The UK range – console, steering column, joystick, mouse and sevenplayer adaptor – is finished in sleek black to adhere to Sega's policy of aesthetic continuity. Although the firm is obviously keen to show off its wares now, the Saturn's release date is still firmly set at fourth quarter '95.

Sega has decided that it will not be facing Sony head-to-head at the ECTS. Instead, it will hold its own simultaneous offshoot event, offering shuttle services to and from the main ECTS venue. It has promised that the attractions on show at its encampment will more than compensate for the inconvenience of the joint-venue setup.

Edge wonders how Sega will handle Sony's presence at E³, where the PlayStation's US launch will be backed by a reputed $4 million spend at the show alone...







Recently announced Saturn titles include Taito's *Ray Force* conversion (top) and *Wing Arms* (above)















Clockwise from top left: the analogue steering column, due for launch with *Daytona USA* on April 1; the latest incarnation of the AM2 conversion, now with track two; multiplayer adaptor; eight-button joypad; mouse; and memory cart

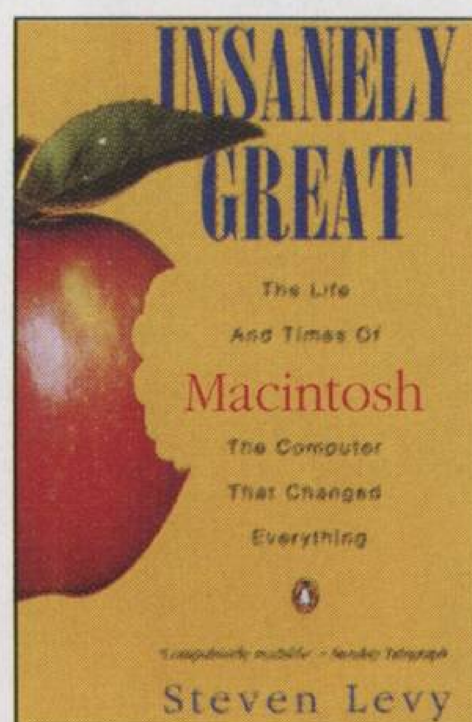
Saturn release schedule

Selected Japanese releases for the next two months.

March 10	***Panzer Dragoon*** (Sega) ¥6800
March 24	***Deadlus*** (Sega) ¥6800
March 31	***Side Pocket 2*** (Data East) ¥6800
April 1	***Daytona USA*** (Sega) ¥6800
April 28	***Virtual Hydlide*** (Sega) ¥7800
April 28	***Astal*** (Sega) ¥5800
April 28	***Game No Tatsujin*** (Sunsoft) ¥8900
May 26	***Pro-Yakyu Greatest Nine*** (Sega) ¥6800
May	***Parodius Deluxe*** (Konami) ¥TBA
June	***Shinobi*** (Sega) ¥5800

Essential reading

Insanely Great: The Life And Times Of Macintosh



- **Steven Levy**
- Penguin, £7.99
- ISBN 0-14-013910-9

Steven Levy is a self-confessed Macophile. The Macintosh, he argues, was 'the computer that changed everything'. And so it was. Without it, the graphical user interface might still be languishing in obscure research labs. It took a company with Apple's drive and vision (not to mention an audacious corporate raid on Xerox's R&D facility) to make it happen. But the Macintosh also took Apple to the brink of catastrophe.

In the early 1980s, Apple was a maelstrom of conflicting personalities. Besuited businessmen mingled uneasily with jeans-clad electronics geniuses. And then there was Steve Jobs. Neither a tech-head nor a conventional corporate player, Apple's co-founder was nevertheless a visionary who could take much of the credit for the company's success. But he was also a loose cannon whom the suits tried desperately to tie down. Brusque, egotistical and overbearing, he could be both a powerful driving force and a severely disruptive presence.

So when Jobs took over the Macintosh project, it was a mixed blessing. He was intensely committed to the system – it was he who described it as 'insanely great' – but he was also unable to brook any opposition to his decisions. And he made mistakes. When, after a frenzy of missed deadlines, the Mac finally hit the shops in 1984, it was lumberingly slow and chronically short of memory – at Jobs' behest it had been shipped with just 128K of RAM and no hard drive. Luckily for Jobs, his staff had secretly (and against his explicit orders) designed expansion potential into the machine, enabling Apple to stave off disaster by rush-releasing a 'fat Mac' with 512K of RAM and a hard disk.

Ultimately, the Macintosh vindicated both Jobs and Apple. The arcane arguments that had exercised the minds of the development team (such as the optimum number of mouse buttons and the advantage of pull-down over pop-up menus) were justified. Since the 1940s, scientists had been dreaming of machines that would revolutionise the way people worked. The Macintosh was that machine. The operating system, with its delightful sense of fun and unprecedented ease of use, won over technophobes – like Levy himself – who would otherwise still be using typewriters. Not only was the Macintosh a major catalyst in the development of the personal computer, but its tumultuous history makes a fascinating read.



Datebook

March

Spring ECTS March 26–28, Olympia, London. The European Computer Trade Show. Tel: **0181 742 2828**

April

Virtual Reality and Scientific Visualisation April 23–26, Hangzhou, China. Contact Prof Shi Jiaoying at Zheijang University. E-mail: **cs_shijy@zunet.ihep.ac.cn.** Fax: **+86 571 7951358**.

International Training Equipment Conference April 25–27, The Hague, Holland. Tel: **+44 985 846181**. Fax: **+44 985 846183**

May

Electronic Entertainment Expo (E^3) May 11–13, Los Angeles Convention Center, Los Angeles, California. Tel: **+1 914 328 9157**

China International Amusement machine Show May 20–26, Shanghai Trade Centre. Tel: **+813 3220 2508**

June

Virtual Reality '95 June 6–9, San Jose, California. Tel: **800 632 5537** (USA only); **+1 203 226 6967**. Fax: **+1 203 454 5840**

Asian Amusement Expo June 7–8, Hong Kong Amusement and Exhibition Centre, Wanchat, Hong Kong. Contact show organisers William T Glasgow, Inc, 16066 South Park Avenue, South Holland, IL 60473-1500. Tel: **+1 708 333 9292**. Fax: **+1 708 333 4086**

Taiwan Amusement Machine Exhibition June 22–28, Cetra Exhibition Hall, Taipei, Taiwan. Contact Taiwan Slot Machine, 2F, 17 Pao Ching Street, Taipei, Taiwan. Tel: **+886 2 746 6860**. Fax: **+886 2 746 6875**

TILE '95 June 13–15, Maastricht, Holland. International Conference and Exhibition on Technology and Design in Leisure Attractions and Museums. Contact Andrich International. Tel: **+44 985 846181**. Fax: **+44 985 846163**

Show organisers: if your show isn't listed here, it's only because you haven't told **Edge** about it. Send details to **Datebook, Edge, 30 Monmouth Street, Bath BA1 2BW.** Tel: 01225 442244. Fax: 01225 338236. E-mail: edge@futurenet.co.uk.

it would look
ppopotamus
arlic press?



SOFTIMAGE® 3D

Bob Greenberg
CHAIRMAN/CEO,
R/GA DIGITAL STUDIOS

CREDITS: Shell, "Dancing Pumps"; diet Coke, "Nightclub"; John Hancock, "Peaceable Kingdom"; Zelig; Predator; Demolition Man; Eerie understanding of Art Brut.

Letters

Express yourself in **Edge**. Write to: **Edge** letters, 30 Monmouth Street, Bath, Avon BA1 2BW

I am writing about the Pippin console standard recently announced by Apple. Now, I know that P J Ogden wrote [**Edge** 17] to 'categorically' state that this console would 'make mincemeat' of its competitors (in other words, PlayStation, Saturn, Ultra 64, 3DO M2). The hardware specification for the standard may do so in theory, but what about the software support? So far, games for Apple machines have been less than exciting when compared to the flood of quality titles currently hitting the PC. Games support has always been slack for the Mac, and even now that the Power Macintosh range has arrived and is running circles around Pentiums, nothing has changed. Oh yes, a few old games have been updated, and *Doom* is on the way, but largely, nothing new has happened.

It is doubly disappointing, then, to learn that the first Pippin game supporters are CyberFlix, of *Lunicus* 'fame', and Presto Studios, responsible for *Journeyman Project* – two sluggish CD-streamers without a clue about what realtime is, or indeed, sprites. No doubt Apple thinks that these are top-grade titles but the rest of us know how lousy they are. And I'm beginning to think that the near-compatibility between the Power Mac and Pippin is more a curse than a benediction. Because what else could happen than a flood of old, boring re-released Macintosh games? So it would appear that the Macintosh/Pippin relationship could be no more than the Amiga/CD³² one. More likely, Apple is hoping that the Pippin will be the CD-i that CD-i never was. Let us only hope that it gets to be much more than that. But until the real game developers kick in, this machine is destined to fail miserably. Which is funny when you consider that the PowerPC chip is by far the most powerful beast in any home machine today.

Rasmus Keldorff, Aarhus, Denmark



Login magazine, Ascii Corp

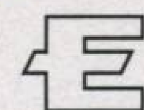
Rasmus Keldorff is sceptical about Pippin's ability to improve on the Mac's less than glorious record as a games system. Will the machine include extra graphics hardware that the Mac so conspicuously lacks?



The Human Creative School in Tokyo is Japan's way of ensuring that the flow of new games talent doesn't dry up (see letter from Imran Ali)

The Macintosh was never designed to cope with graphically demanding applications such as games. The operating system offers virtually no graphics instructions (apart from *QuickDraw*, used to produce geometric shapes for windows and dialogue boxes) and the lack of graphics hardware assistance is also a drawback. This makes scrolling, for example, extremely difficult, even on a high-end Mac. Unlike the PC, the Mac's unified operating system is an integral part of the machine, and games coders need a great deal of skill to bypass it effectively. The PC also has the advantage of a large development community which, over the years, has evolved various means to make the most of the system's abilities.

It's not yet clear whether Bandai's Power Player (the first Pippin machine) will contain additional graphics chips to supplement the PowerPC 603 CPU. If it does, the Mac OS will almost certainly need to be upgraded to make use of the new hardware. Conveniently, the next major upgrade of the Mac OS (development name *Copland*) is due to be released for desktop Power Macs within a year. It's conceivable that, to maintain compatibility, it will contain 'redundant' commands that Pippin can use.



I am a second-year software engineering student and I am currently looking for an industrial

placement for the third year of my degree. I would eventually like to work within the videogame or multimedia areas of the software industry, but I am having difficulty securing a placement from companies in these fields. **Edge** has become a valuable resource for me in ascertaining the skills I need, through the recruitment advertisements published in the classified section, but all the companies I have contacted only seem interested in either graduates or candidates with years of experience. Many do not even take the time or effort to reply – of the 46 applications I have made to date, only East Point Software has responded with interest. I find it worrying that with the shift towards console-based development, the traditional programming training ground of home computers such as the Amiga and ST will soon evaporate. As such, the only pool of recruitment will be professionally trained students, such as myself. But as my job-hunting experiences show, most companies are simply not encouraging the development of fresh talent, and the evolution of the industry is being stifled.

I believe publications such as **Edge**, which is respected worldwide by the games industry, need to lobby on behalf of the search for new talent. A programme to encourage student placements would be extremely effective. In fact, establishing a register of candidates could prove to be a valuable mechanism for placing candidates. I look forward to hearing your views on the subject (and any offers of a placement, of course!).

Imran Ali,
I.Ali-iy2d2025@lmu.ac.uk

Your magazine is the only one I buy nowadays, as it's all I need for the latest information on hardware and the most exciting games. However, the appearance of all these new consoles poses a serious question: where are all the new game designers, artists and musicians going to come from? As we all know, the consoles only play games. This worries me, as the only machine where people can get involved with the programming of games is the PC, which is out of most people's price range. In the days of affordable 8bit and 16bit machines, anyone with creative ideas could gain experience in this area.

In my opinion, the future of the games industry is in the hands of the people playing games today. If there are no opportunities for these people, the industry will die. Is the situation similar in Japan and North America?

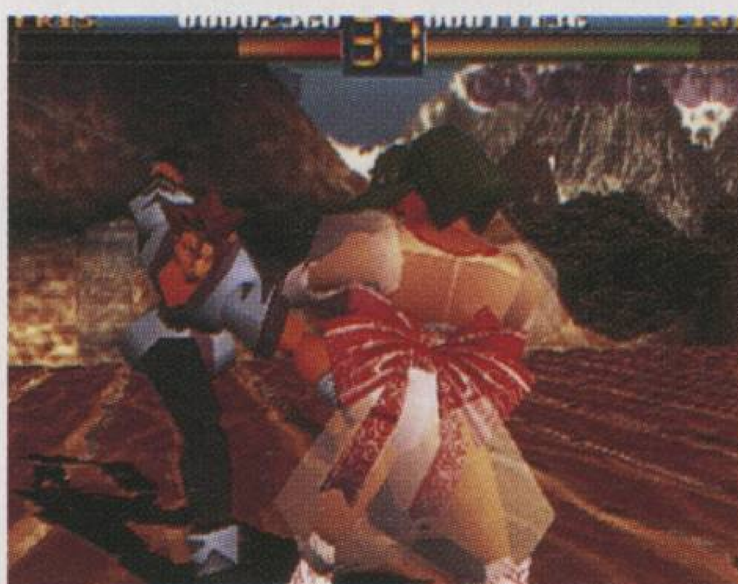
Mark Thacker,
Leicester



Mark Thacker fears that self-taught talent of Geoff Crammond's calibre (*Stunt Car Racer* above) could disappear without cheap home computers









***Motor Toon GP*, *Parodius*, *Ridge Racer* and *Toh Shin Den* (clockwise from top left) all suffer from slowdown, complains Stephen Kofoed**

It's impossible to accurately predict what longterm impact the scarcity of programmable platforms will have on industry innovation, but it is cause for concern. In the past, series of platforms like, for example, the VIC20, C64 and Amiga have enabled serious applications to be created alongside games. As the ST and Amiga slowly disappear, the PC is left holding the fort for 'serious' users.

The opportunities for creating games from a bedroom have also disappeared to a large extent. David Braben's skill as a programmer is not in question but the heavily delayed *Frontier* just could not compete with the huge budgets and large teams available for titles by companies like Origin. Development houses are increasingly likely to employ graduates with a proven record. In Japan, programming is seen as a profession for which training is needed, and games programming schools are not uncommon. In the USA, there's more training all round, although the quality of many US-coded console games implies that talent isn't always a prerequisite for getting a foot in a developer's door.

Edge does indeed have a role to play in the nurturing of future talent. The magazine is getting increasingly involved with development issues – as shown by its sponsorship of the Develop! conference.



Recently I decided to take a leap into the 32bit gaming world and purchased a Sony PlayStation on import. The machine looks good but I am beginning to doubt the power of the hardware. I bought *Ridge Racer*, *Motor Toon GP*, *Toh Shin Den* and *Parodius Deluxe*. What distresses me is the slowdown that is evident in each game. With specs of 360,000 polygons/sec, I don't see how *Ridge Racer* should slow down, but it does. At half the frame rate of the arcade version, surely the machine should easily be able to move the 110,000 or so polygons every second (the arcade shifts 220,000/sec). *Toh Shin Den*'s 90,000 polygons also slow down at times when the angle zooms close on some of the backgrounds. *Motor Toon GP*'s smooth frame rate also drops occasionally, especially in outside car view. But to top it all, *Parodius*, which looks very 16bit to me, also slows down. Where are those 4000 sprites?

I hope you don't feel I am being picky, but for a machine with its stated power (more than Namco's or Sega's arcade boards), I expect these less-than-arcade-quality games to run without any problems at all. I paid Aus$1000 for this machine and I enjoy the games, but I can't help thinking that it won't live up to expectations. I'd value your opinion, and so will other PlayStation owners in Australia.

Stephen Kofoed,
New South Wales

Unfortunately, polygon maths is not quite as simple as you suggest. A direct comparison of arcade and console power is misleading due to the number of custom chips in a £10,000 coin-op. And comparing polygon rates is dangerous because (as is the case with *Ridge Racer* and *Virtua Fighter*) polygons are often constructed in different ways in the console versions, using differing amounts of processing power. Shifting plain polygons is relatively simple for most machines, but when additional effects are applied to them, any graphics processor will take a big hit in performance.

In *Ridge Racer*, for example, the action moves at over 30fps until objects (such as the helicopter and other cars) move close to the camera, whereupon it slows down, sometimes noticeably so. This is due to the light sourcing, Gouraud shading and detailed texture mapping being calculated in realtime. The same is true when it come to detailing the characters in *Toh Shin Den* at close range. This problem could possibly raise its head more often than traditional sprite slowdown (something that early adopters of the Super Famicom brooded about) because programming in 3D is more complex than 2D – there are many more elements that demand processor time. If *Ridge Racer* had been coded so that no more than three cars ever appeared onscreen at once,

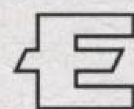
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viewpoint

there would probably have been no slowdown. But then it wouldn't have been as much fun. Decent programmers will be able to balance their code so routines have enough extra power for special occasions but don't affect the speed or smoothness of the bulk of the action.

***Parodius*' problems are probably due to time constraints affecting tight programming and speed optimisation. Shovelware like this is never noted for its technical proficiency and those '4000 sprites' are considerably reduced once a couple of layers of parallax scrolling are moving.**

Give programmers time to adjust to the PlayStation's foibles and arcade-perfect conversions shouldn't be impossible. The question of determining appropriate benchmarks will be addressed in Edge in the next few months.



Why is it, whenever people like Time Warner decided to get involved in the industry, they have to throw their weight around? The last time Hollywood took an interest in the industry, it



collapsed around its ears. Time Warner doesn't even know which horse to back (and it looks like it has chosen all the wrong ones). Perhaps this trend will stop with Sony. At least it's got an interest in hardware production under its own name. Roll on autumn…

Paul D. Hobson,
MFVUGPH@fs1.go.man.ac.uk,
Manchester

Large companies often approach new markets with the expectation that they can buy talent and experience. But because they don't possess the kind of in-depth knowledge that can only be accumulated, not bought, they often fail. Sony has lost in excess of £1.5 billion since it waded into the murky waters of Hollywood in 1989 (although Sony Pictures is now starting to look slightly more buoyant). If Time Warner wants to spend its cash in this way, that's its decision. The company undoubtedly remembers better than anyone how much its last major excursion into the videogames industry (the Atari débacle) cost it. Whatever the outcome, you could hardly expect TW to enter the fray quietly.



I'm currently looking to buy a PlayStation (as, of course, are many other people). After reading issue 18 of your magazine, I have a couple of concerns. My first concern is your review of *Toh Shin Den*. Surely, I thought to myself, even though the game plays like Stevie Wonder plays darts, it shows the PlayStation's huge potential and therefore its advantage over the Saturn. For instance, Sega's dodgy programming often leaves characters more see-through than a politician's promise, whereas *Toh Shin Den* (if I am to believe your review) has a far more solid and reliable graphics system. So, is it not the case that already Sony is showing its prowess over big scary Sega?

My second (and more important) concern is about a rather disturbing feature of certain screenshots of PlayStation games. It has come to my attention that the polygons that are situated at the sides of the player's perspective tend to 'fold'. For example, in issue 16, page nine, screenshot numbered 8, there is clearly some distortion on the left-hand building. This is also apparent on Sony's own video for the PlayStation. Is this something that the company has overlooked?

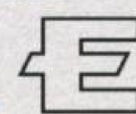
Richard Burgess-Dawson,
Castleford



Eagle-eyed Richard Burgess-Dawson has spotted polygon distortion in PlayStation games

If you're after glitzy visuals and garish fireballs, *Toh Shin Den* is certainly superior to *Virtua Fighter*. But your argument that the PlayStation is better than the Saturn purely because of this is specious. They are different types of game and hence use contrasting methods to produce their thrills – *VF*'s realistic, wincing blows vs *Toh Shin Den*'s glamorous effects. Yes, camera angles do jump in Saturn *VF* and the clipping occasionally goes awry, but the game was programmed with an emphasis on retaining the arcade's playability rather than adding new effects. The game is therefore faster and ultimately more rewarding than *Toh Shin Den*. If you want straight hardware comparisons, wait until *Daytona* arrives in early April.

The peripheral distortion in some shots is simply a product of the PlayStation's method of drawing polygons – like the Saturn it shifts a surface rather than a collection of individually calculated pixels. *Kileak The Blood*, *Space Griffon* and *Ridge Racer* exhibit similar effects, and those with a sharp eye will recognise that even the arcade version of *Daytona USA* suffers from a similar quirk.



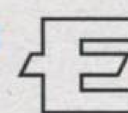


Nintendo's decision to forgo the benefits of CD-ROM for the Ultra 64 has attracted criticism – unfairly, believes Chris Hunter

I am writing to point out that your magazine is basically not as good as it was. Whereas **Edge** used to cover a wide variety of formats, it is now dominated by the Saturn and PlayStation. Sure, they're good, but hardly any of your readers will have them. There is a lack of 3DO reviews and previews, yet there are a lot of 3DO games coming out that you haven't looked at. Look back over past issues, see what made them so good and try to reinvent **Edge** based on this. If you don't, I think sales figures will fall.

Michael Bucheler,
Hythe

The past few months have seen two of the most crucial hardware launches of the decade and Edge would have been failing in its duty had it not covered both in detail. This led to a temporary leaning towards PlayStation and Saturn software, but not to the total exclusion of other platforms. Edge will continue to cover innovative software, regardless of the platform it's on, but don't expect blanket coverage of whatever machine you might own. Do expect more coverage of existing formats, though, including occasional focus on older technology like Nintendo's Super FX chip (Edge 21).



I feel I have to jump to Nintendo's defence regarding the number of issues that it has been criticised for in recent months. Firstly, people are worried about Nintendo's option to use cartridges instead of CDs. As I see it, Nintendo will find a way around it for several reasons. Firstly, although the carts will be big, the idea that they will be as

expensive as Neo-Geo carts is stupid. Look at Jag carts – they're for a 64bit machine but they're not expensive. The reason Neo carts are expensive is that they have all the special chips in them. Also , after reading David Sheff's excellent Game Over, I am sure that the big 'N' will, through the clever strategy and the fierce determination of Hiroshi Yamauchi, be able to come out on top as always.

Secondly, Nintendo has been criticised for bringing its system in late, and people are even questioning whether the Ultra 64 exists at all. This will be the third time that Nintendo has brought in a later – but superior – piece of hardware and the previous two times it has benefited greatly from this tactic. A year before the release of the PlayStation, there were no working models of the machine, only tech specs, whereas with the Ultra 64 you can already try out two games in your local arcade.

I'm not trying to slag off Nintendo's competition but just trying to describe the good points of a company that has received so much bad press in recent months.

Chris Hunter, Lancs

Edge is not in the business of criticising Nintendo without justification. It's just that some of the company's decisions seem slightly perplexing. Sega, Sony, NEC, Atari, Bandai and even SNK now all use CDs as a storage medium, so Nintendo's decision to stay with cartridges seems to run counter to accepted wisdom.



'Angel' reckons M2's technical specifications were subject to some creative accounting on the part of 3DO CEO Trip Hawkins

The fact is that CD-ROMs are substantially cheaper and easier to manufacture than cartridges. Not only does ordering large numbers of cartridges prove incredibly expensive for thirdparties (few companies are prepared to put a couple of million upfront for a game that they don't know will sell), but it creates vast inventory problems – something that almost killed the 16bit market in 1994. Nintendo is tackling this problem by selecting its own thirdparties instead of opening up Ultra 64 development to everyone, but that's no guarantee of quality. CDs allow thirdparties to order stocks tentatively and then re-order more if the market demands it.

Atari's Jaguar's carts are relatively cheap simply because they are so small – usually around 16 megabits, which is no larger than many SNES or Mega Drive carts. Similarly, Neo-Geo carts are ludicrously pricey because of their mammoth ROM size, not because of the use of any special chips. Both the PlayStation and Saturn have quashed fears of agonisingly long access/loading times using custom hardware so it seems that Nintendo's insistence on carts is due to a desire to retain control. It is banking on cheap, high-density memory to preserve the monopoly on cartridge manufacturing it has established over the years. High-density RAM is currently expensive and impractical, but the company is rumoured to be sinking millions into its development.

It's a fallacy that Ultra 64 arcade games will make their way unchanged into the home. The first Ultra 64 coin-ops have little in common with the forthcoming console, apart from the logo on the cabinet.





Japanese retailers have been the first to witness the massmarket switch to CD-ROM and are reaping the benefit (see Chris Hunter's letter)

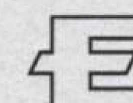
Firstly, congratulations on your excellent and successful publication. I'm always impressed by the level of technical competence displayed by your journalists. However, I'm surprised that in the news pages of issue 16, you let Trip Hawkins get away with suggesting that 2.5 times as many transistors implied 2.5 times the processing power. It's akin to the age-old argument about MIPS, MOPS, FLOPS and so forth: these benchmarks are at best insufficient and at worst actually misleading.

For example, consider a machine rated at 21 MIPS [million Instructions per second] versus a lowly 10MIPS machine. If the 21MIPS monster takes three instructions to perform an operation that the 10MIPS machine achieves in one, then the 21MIPS machine will only perform seven operation to the 10MIPS machine's 10 operations. To return to the transistor argument, the 80486 has (I seem to recall) 1.2 million transistors compared to the 68030's lowly 300,000. Speed for speed, the SPECint [whole numbers] benchmarks favour the '030 systems over 486 PCs and when you add a 68882 (I don't know how many transistors – say another 300,000) it pulls ahead in SPECfp [floating points]. The 80486's transistor count can't overcome the 68030's architectural advantages.

Of course, I'm not rubbishing Trip Hawkins' figures, only his reasoning: 3DO may have come up with a polygon engine 2.5 times faster than the PlayStation's. If so, this is due to its VLSI design skills, not a larger die size.

'Angel', Swansea

Until we see what M2 can do, Trip's number juggling is largely irrelevant. In technical terms, the speed at which any computer program operates is a product of the number of instructions in the program, the average number of cycles required to execute an instruction and the clock cycle period. Reducing the number of instructions in a program, the average number of cycles required to execute an instruction or the clock cycle period would all have an effect on the speed at which a program runs. Users of CISC (Complex Instruction Set Computer) chips try to reduce the first factor while RISC (Reduced Instruction Set Computer) chips, such as M2's PowerPC, represent at attempt to reduce the second. Both have disadvantages (which designers partly overcome by using very high clock speeds) as well as advantages. However, with processors as fast as the PowerPC, the speed of RAM is just as important a consideration as anything else in the design of new systems. For example, EDRAM (Enhanced Dynamic RAM) runs at about twice the speed of conventional DRAM memory yet costs only a fraction more.

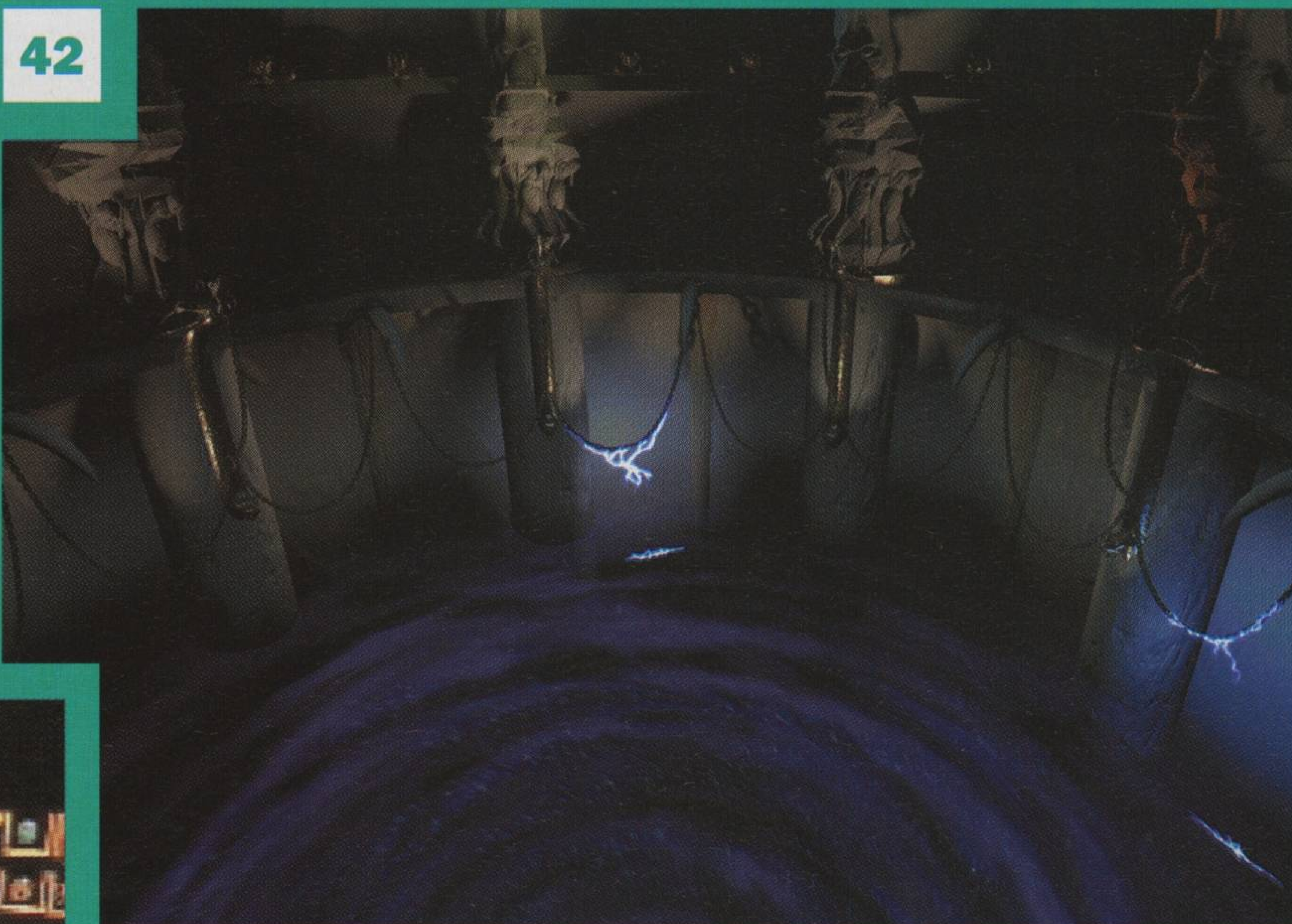


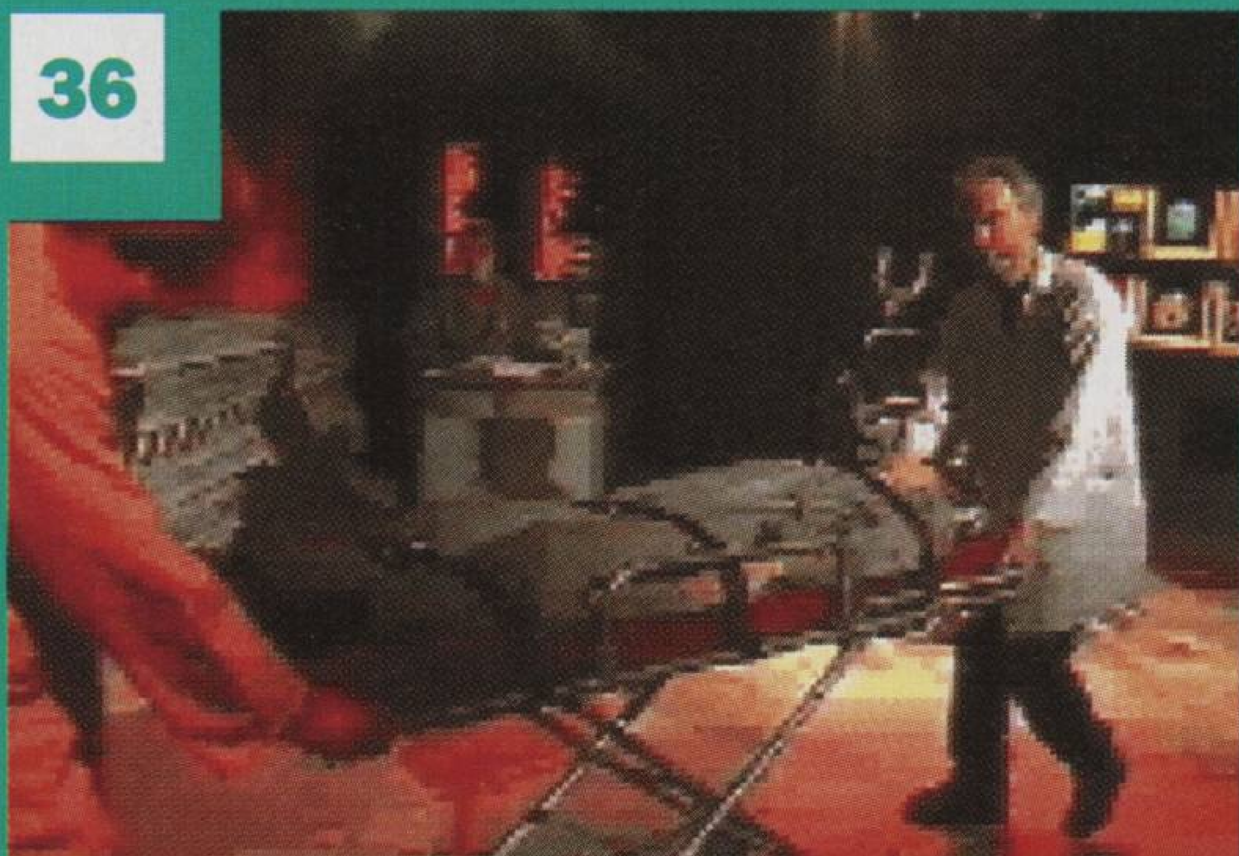
Prescreen

The pursuit of aesthetic excellence is no more evident than in Amazing Studio's labour of love, *Heart Of Darkness.* **Edge** has the full story of its three-year creation.

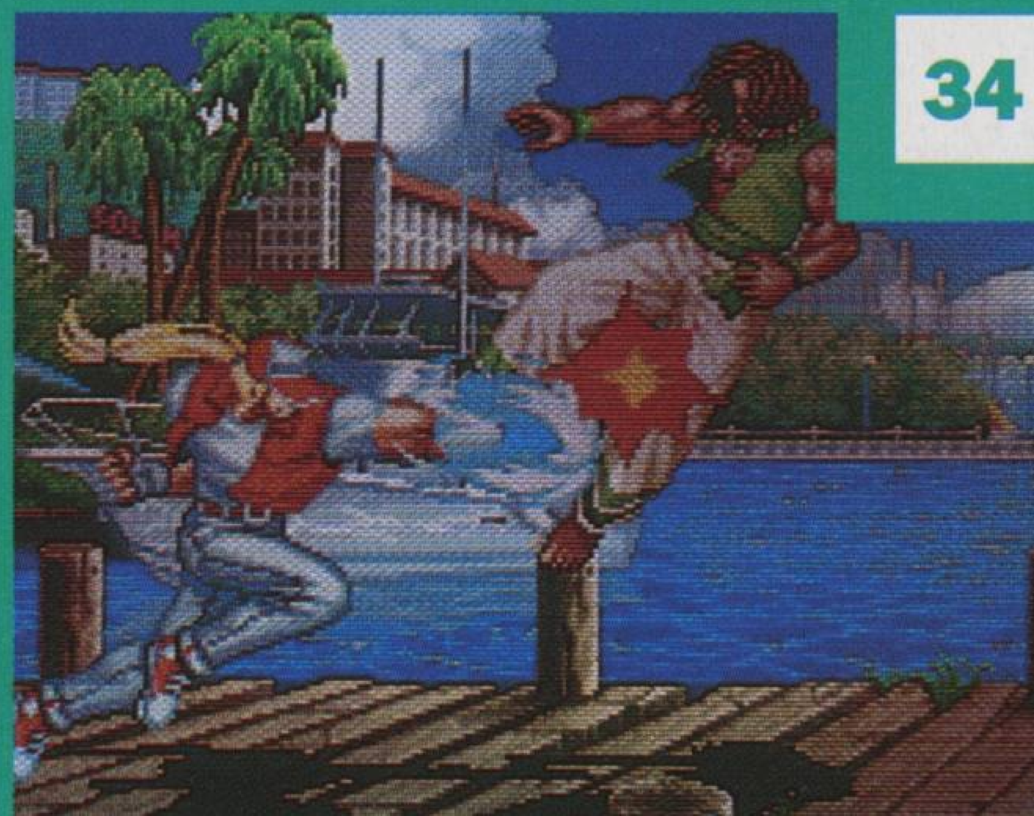
Also this month: SNK's Neo-Geo CD gets yet another instalment of the now legendary *Fatal Fury* series, and an ageing Sega title, *Hydlide*, receives a new look for the Saturn. Plus: 3DO's under-used 3D abilities are called into play in EA's *Immercenary* and the splendid US blaster, *PO'ed.*


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Astal

Sega's striking new Saturn platformer looks good enough to eat. But how tasty will the gameplay be?



Format:	**Sega Saturn**
Publisher:	**Sega**
Developer:	**In-house**
Release date:	**May**
Origin:	**Japan**

Vibrant, fairy-tale backgrounds meld with beautiful character design to create a fantastic world to explore

The Saturn is proving that new games machines don't necessarily mean new types of games. Sega's console may be a bona fide next-gen system, but traditional genres are still destined to form a major part of its software catalogue.

One of those genres is the platform game. *Clockwork Knight* is already preparing for a second visit to the machine after its less than impressive first outing (the original title was only the first part of a 12-level series), and it will soon be joined by Sega's latest 2D platformer, *Astal*.

Astal's forte is definitely its graphics. The warm, Disney-esque draughtsmanship is a welcome departure from the antiseptic lines of most of today's computer animation. Vibrant, fairy-tale backgrounds meld with beautiful character design to create a fantastic world to explore.

The graphics are enhanced by skilful integration of the foreground, the background and the characters. Sega has managed to give the visuals a coherence and depth conspicuously lacking in many modern games.

But graphics count for nought without the playability to match. Platform fanatics will be hoping that *Astal* has something to offer beneath the surface.





The action may be conventional, but the quality of the graphics distinguishes *Astal* from its platformer peers







Gorgeous cartoon animations (top left) break up the platform gameplay and provide a visual reward for completing sections of the game

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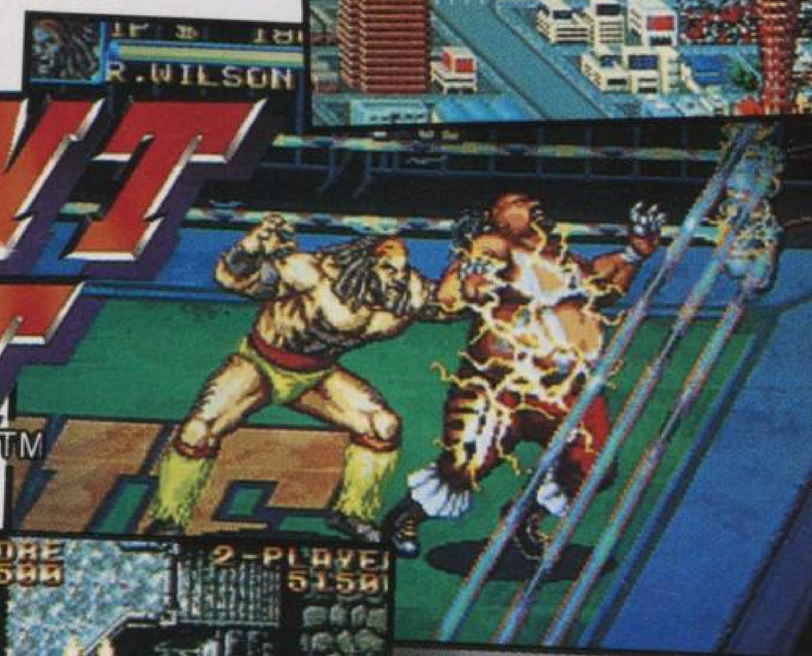
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Virtual Hydlide

Sega's Saturn release programme continues apace, with a spanking new texture-mapped 3D version of a classic roleplayer that first wowed Japanese gamesplayers a decade ago

***Virtual Hydlide* promises to offer players RPG elements that hark back to the *Ultima Underworld* series**

Format:	**Saturn**
Publisher:	**Sega**
Developer:	**T&E Soft**
Release date:	**April**
Origin:	**Japan**

Sega's latest Saturn project is an update of *Hydlide*, the venerable RPG that first appeared ten years ago in Japan as a computer game and was subsequently released as a Mega Drive cart.

You'd be hard pressed to spot the game's lineage in this version, though, because the overhead perspective of the original has now been replaced by a behind-the-character viewpoint and a fully texture-mapped 3D gameworld.



Virtual Hydlide spins a tale of a crumbling kingdom whose ruler, Princess Anne (sic), has recently fallen under a spell cast by Bararis, a neighbouring sovereign with plans to expand his territory. Playing the rather unadventurously named Jim, you set out on a quest to restore the princess to her former self by seeking out three fairies who hold the key to her revival.



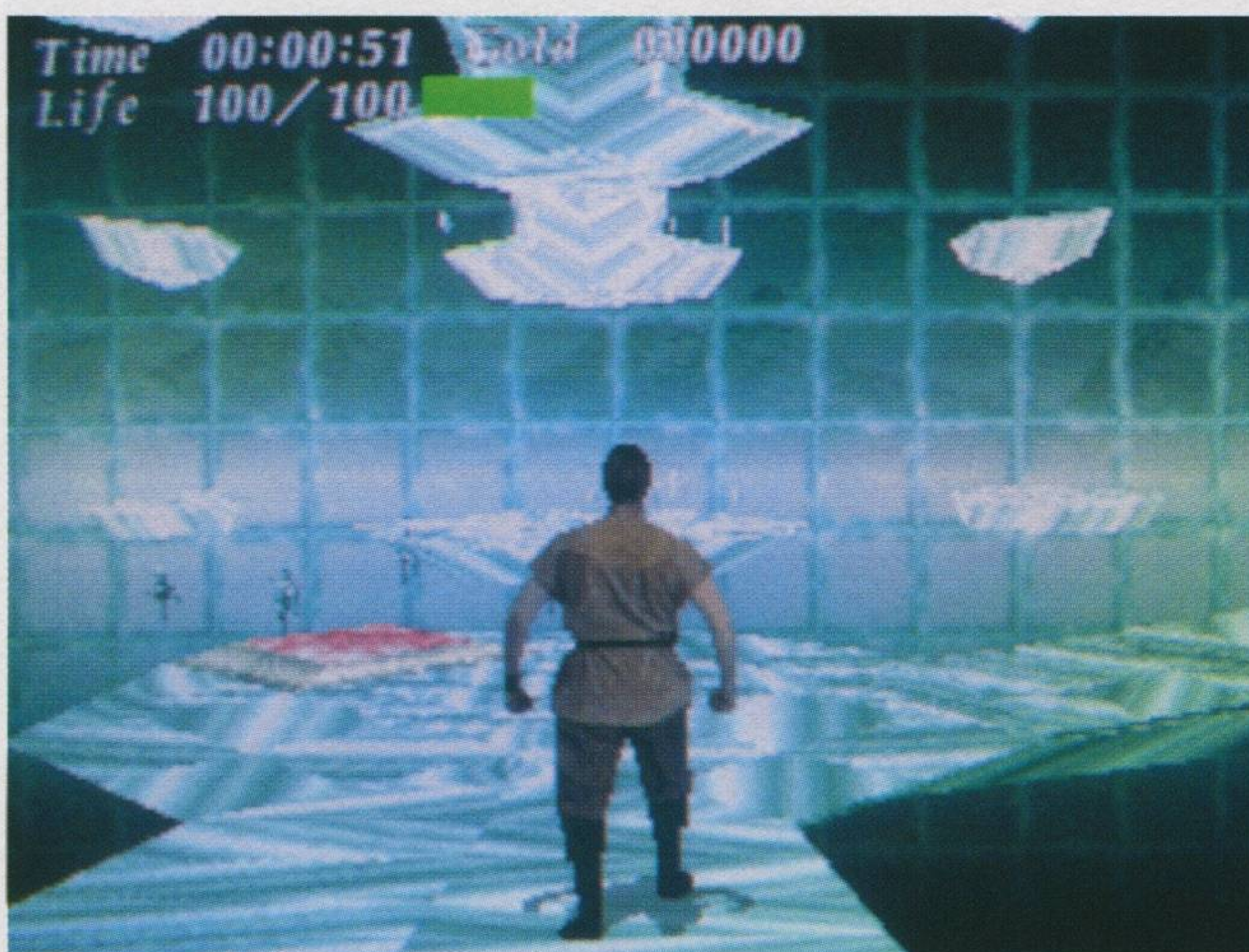
The lead character in *Hydlide* has been digitised from footage of a real actor



The adventure takes place in all sorts of situations. Here, a flooded mine forces Jim to don his waders

The plot may be fairly uninspiring, but *Virtual Hydlide* promises to offer players RPG elements that hark back to the *Ultima Underworld* series on the PC. The characters develop as the story progresses, there's a variety of objects and creatures to interact with, and Jim can run as well as walk through the game environment. Although the game resembles Elite's recent 3DO and PC title, *Virtuoso*, it looks certain to be a much deeper and more involving experience.

It's encouraging to see that thirdparty developers are as keen to venture into 3D territory as Sega itself. *Hydlide*'s reputation alone will ensure that the Saturn version whips up a significant degree of interest in Japan, and its universally appealing presentation makes a Western release seem inevitable. 



Many Japanese 3D games offer only simple, single-level mazes. *Hydlide*, however, has slopes, stairs and a variety of terrains

Deadlus

3D maze shoot 'em ups are not a genre restricted to the PC – the Saturn and PlayStation are also getting in on the act. But so far playability has been a quality conspicuous by its absence

***Deadlus* represents an attempt to strike a pleasing balance between visuals and gameplay**

Format:	**Saturn**
Publisher:	**Sega**
Developer:	**Micronet**
Release date:	**24 March**
Origin:	**Japan**

The Japanese fascination with *Doom*-type games has already had an impact on the release schedules for the next-generation machines. After *Kileak The Blood* and *Space Griffon* for the PlayStation comes *Deadlus* for the Saturn. Awkwardly similar to *Kileak* in appearance, it presents a familiar assault suit scenario set on a satellite installation – the 'Deadlus' of the title. The peaceful ex-Earth colony has been attacked by terrorists and you, as part of a crack squad of assault soldiers, have to track down and eliminate them.

Kileak The Blood failed largely because of its lack of depth and the repetitive nature of the game environment. Few would deny it its incredible atmosphere – generated largely by the impressive interweaving of FMV sequences and realtime graphics – but it was doomed without a strong game at its core.

Deadlus represents an attempt to strike a more pleasing balance between visuals and gameplay. Like *Kileak*, it makes extensive use of streamed pre-rendered footage, but to enhance the central blasting action it also offers a greater number of useable objects, numerous secret passages and hidden traps, and a complex but compact display incorporating all the assault suit's controls and indicators.

If everything comes together as planned, the Saturn could find itself playing host to the type of game that has until now eluded the PlayStation.



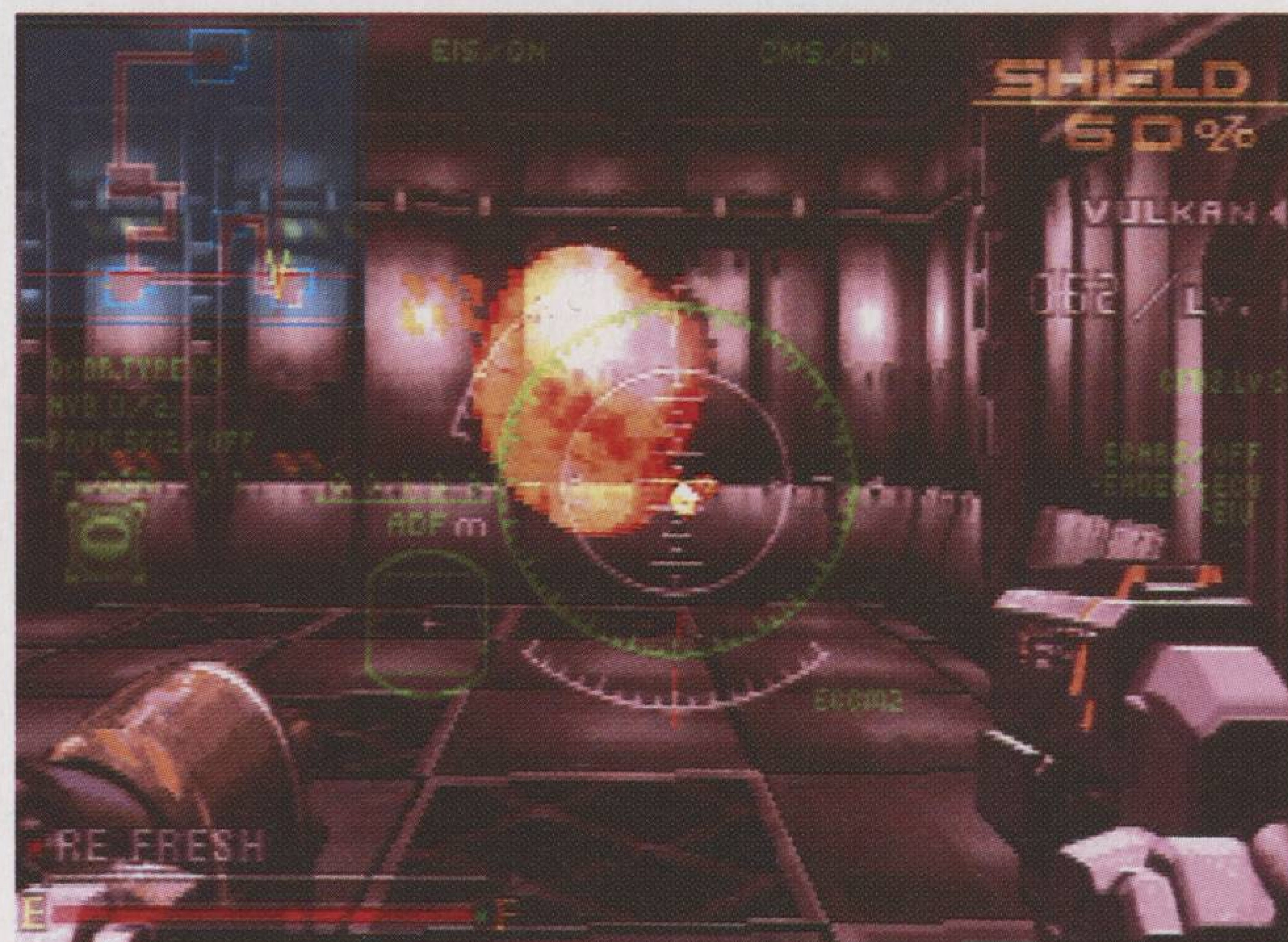






The pre-rendered intro sequence in *Deadlus* includes the usual range of sci-fi imagery. It all adds to the atmosphere





The Saturn should be able to manipulate *Deadlus*' dark environments rapidly (top). Another intruder takes a pasting (above)

SILICA ARE NOW IN 18 BRANCHES OF DEBENHAMS
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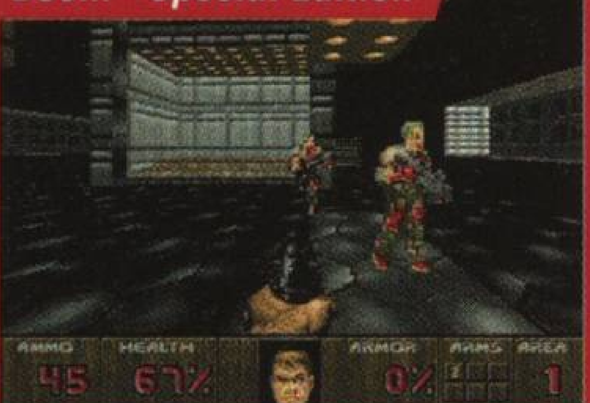
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Fatal Fury 3

Road To The Final Victory

The third reworking of SNK's much-loved Neo-Geo fighting game gets a dual-format release



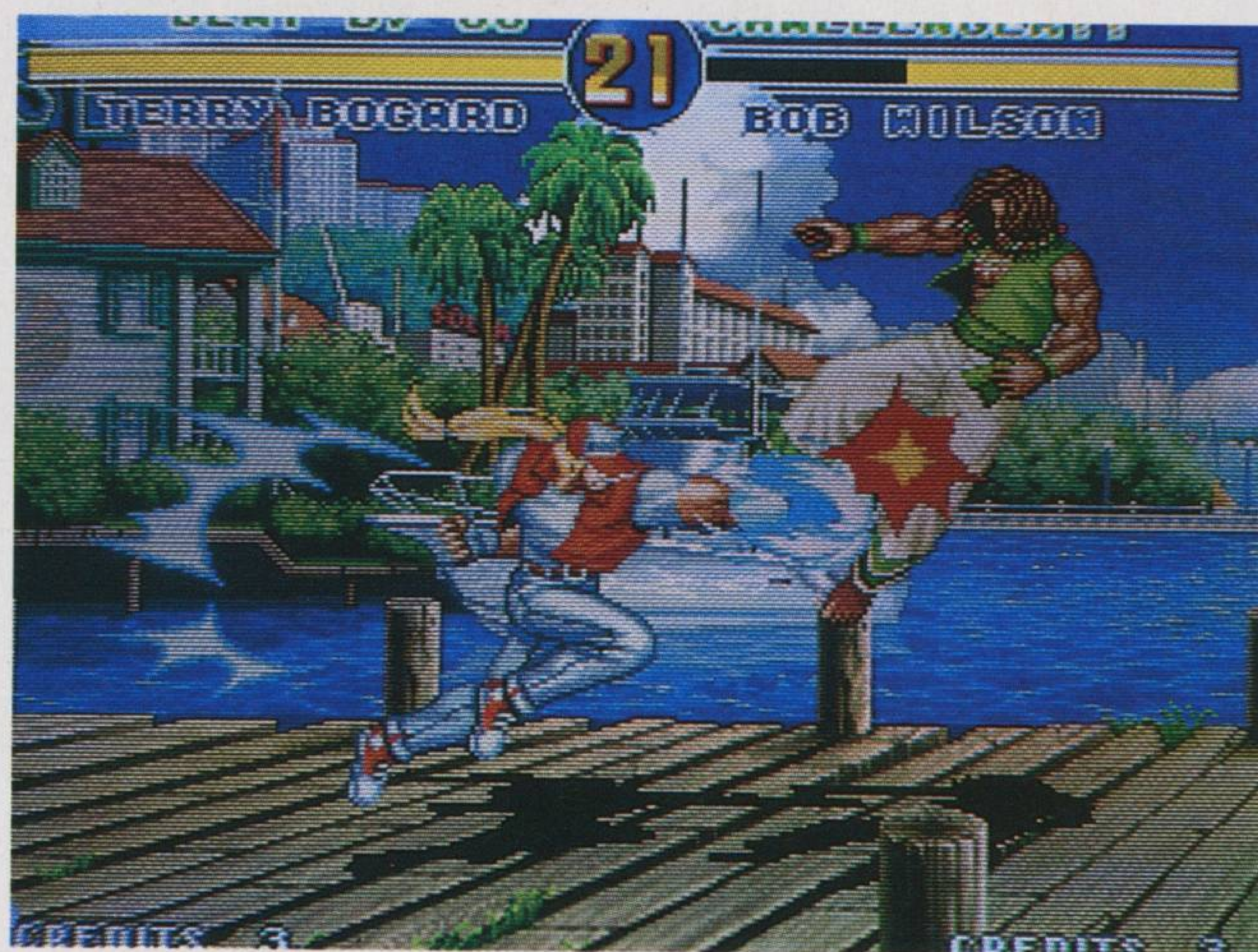
The old *Fatal Fury* favourites are still alive and kicking in part three. Their special attacks and weaknesses have been only slightly tweaked since the original game

Format:	**Neo-Geo**
Publisher:	**SNK**
Developer:	**In-house**
Release date:	**April 5 (cart)** **April 28 (CD)**
Origin:	**Japan**

SNK is the most diehard supporter of the traditional side-on beat 'em up. The company has resisted the temptation to indulge in the 3D orgy that has gripped the gaming world since the début of *Virtua Fighter*, preferring instead to continue refining its long-serving hits, *Art Of Fighting*, *Samurai Shodown* and *Fatal Fury*.

Fatal Fury 3 – all 266 megabits of it – offers five new characters and a variety of new playing techniques to differentiate it from its forebears. Fighters can now follow up throws with special attacks, stringing together moves that were previously impossible, and extra emphasis has been placed on 'combos'. The biggest change is the introduction of a new plane of play: you can now move between back, middle and front.

Certainly, the updates have proved enough to whet Japanese gamers' appetites – *Fatal Fury 3* was one of the stars of the recent AOU. Western audiences, however, are likely to prove far harder to captivate.



Terry Bogard moves between planes to successfully land a blow (top). Even with the new multi-planar concept, the bulk of *Fatal Fury 3*'s gameplay remains firmly in seen-it-done-it territory (above)







Clean but clichéd backdrops prevail (top and middle). The new line-up (above)

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Immercenary



Format:	**3DO**
Publisher:	**Electronic Arts**
Developer:	**Five Miles Out**
Release date:	**March**
Origin:	**US**

Promising first-time developer Five Miles Out launches itself into inner space with a VR-themed 3D shoot 'em up for the 3DO











***Immercenary*'s intro sequence details the events leading up to the adventure itself. Following a distress call and a failed attempt to send a volunteer to help, it's now our hero's turn for projection...**

Games with virtual reality plots have long since become old hat in the fast-moving videogames industry. But EA is convinced that there's life in the ageing dog yet and is demonstrating that faith with its forthcoming title, *Immercenary*.

The scenario hatched by developer Five Miles Out is typically far-fetched. In the distant future, a virtual environment known as Perfect has consumed humankind. The population of Earth spend their lives mentally linked to a gaming grid while their physical bodies atrophy and eventually perish from neglect.

The player assumes the role of a present-day VR bandit who has discovered a method of jacking in to any computer location in any dimension or time via an advanced form of astral projection. After receiving a distress call from one of its inhabitants during an experiment, he enters the grid with the aim of shutting down its system controller, thereby saving the human race.

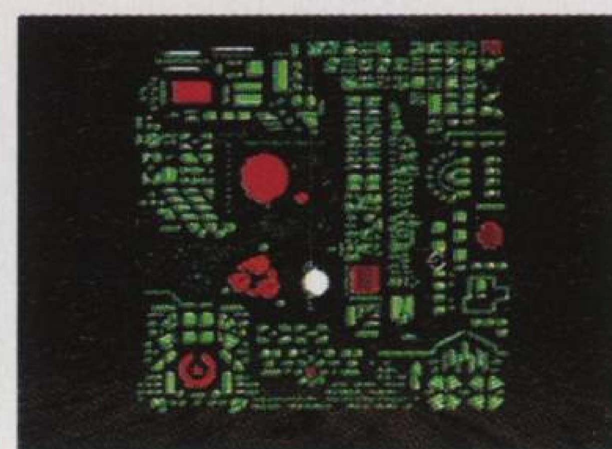
Perfect is populated by 17 types of simulated lifeforms known as Rithms, each of which has its own rank and class – different Rithms possess



You have to put in some serious character development before taking on Medusa



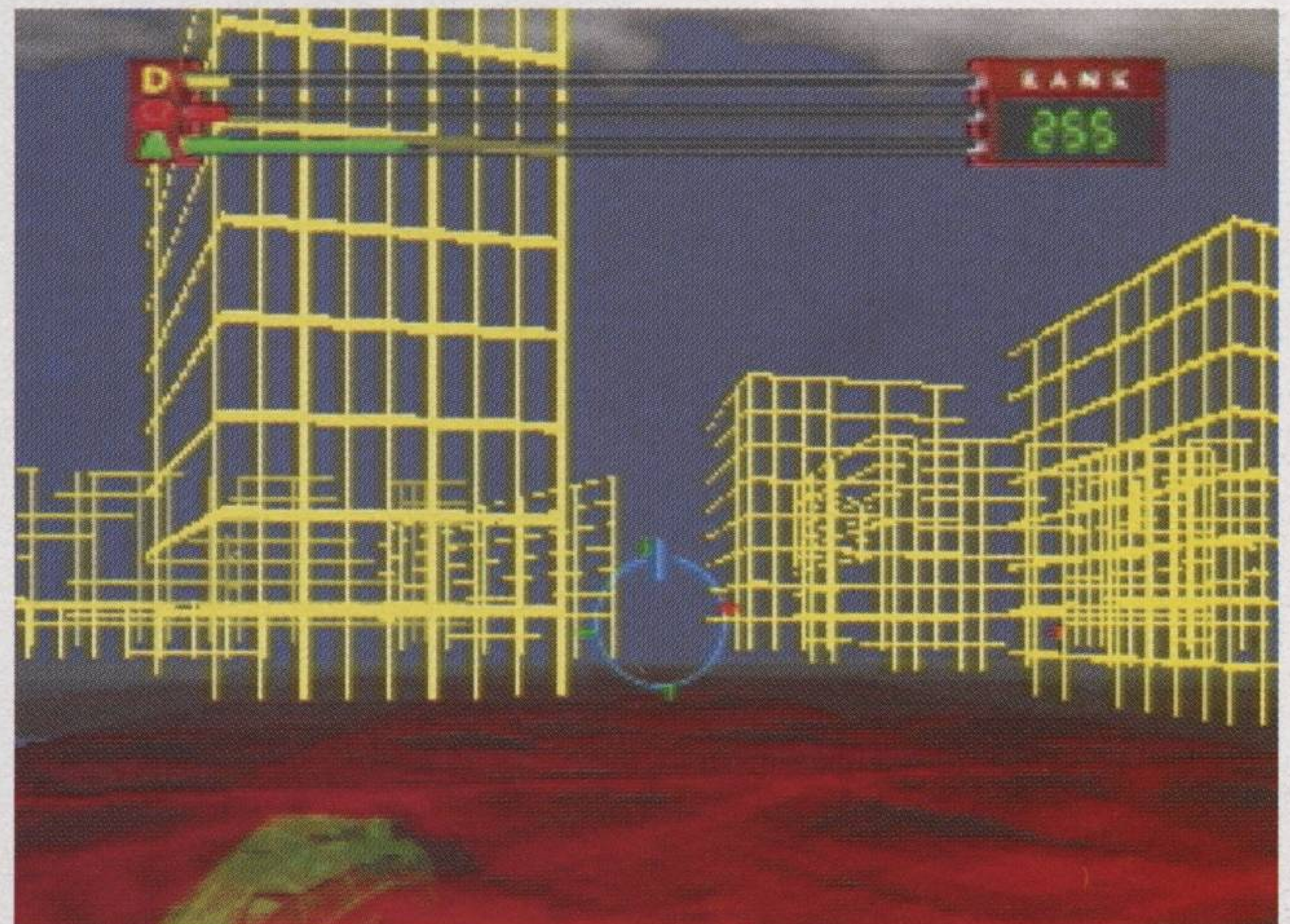




Although many buildings feature doorways (left), unfortunately you can't actually go through any of them. Negotiating the gameworld is made easier by the two ingame map options – zoom and wide view (right)





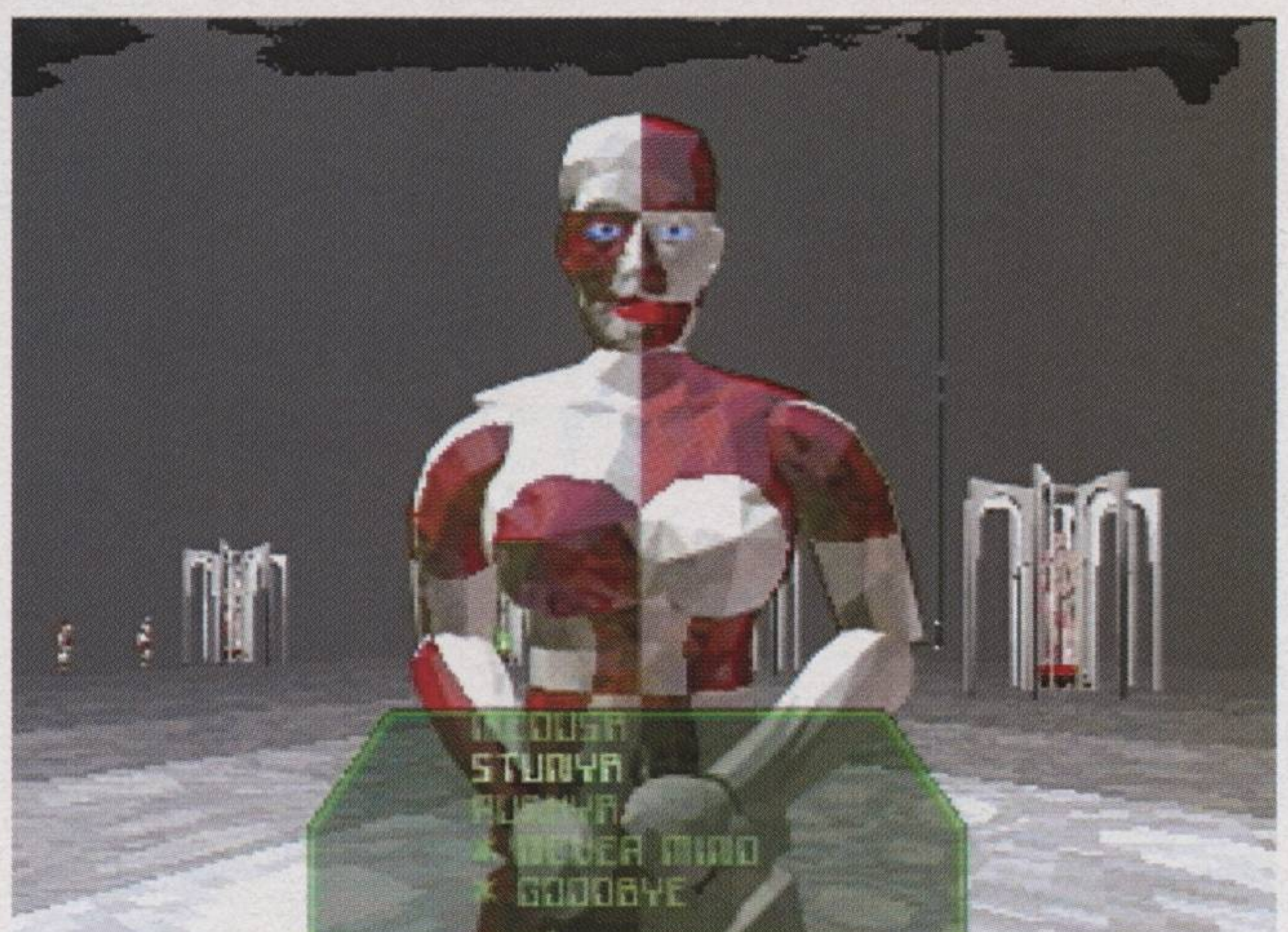


The developer

Five Miles Out was formed in spring 1993, and *Immercenary* is its first project. The team comprises six members drawn from the fields of video, music and computer entertainment, only one of whom – J D Robinson, designer of cult shoot 'em up *M.U.L.E.* for the Commodore 64 – will perhaps be familiar to long-serving videogamers.



Recharge spent energy by visiting these spires (above), themselves charged by the power of electrical storms (top)



This boss proves to be a tough foe (top); part of Perfect is contructed from vector graphics (middle); talking to one of the locals (above)

different strengths, weaknesses and behaviour patterns. To get to a position where you can destroy the sysop (called 'Perfect 1'), you have to develop your own ranking by 'crashing' other lifeforms, using straightforward search-and-destroy tactics.

Not all occupants of the grid represent a threat, though: non-aggressive types quietly go about their own business unless provoked, and others even fight among themselves, giving you the opportunity to hang back, wait until the battle is resolved and absorb the energy pool left behind by the fallen combatant.

The game environment takes the form of a surreal sprawling cityscape made up of texture-mapped and wildly coloured polygon buildings which the 3DO manipulates smoothly at speed. There are also sectioned-off regions away from the main play area in which the 11 bosses reside. These often maze-like structures provide a claustrophobic atmosphere in sharp contrast to the open spaces where most of the game takes place.

The core shoot 'em up gameplay is enhanced by your ability to communicate with other characters. Using a simple list of questions, you can press certain inhabitants of Perfect for clues to facilitate your mission. Characters willing to share information are portrayed in close-up by both pre-rendered computer sequences and live-action footage.

It's disappointing that more isn't made of the buildings – instead of being used as mere decoration, they could easily have been employed to give the game an interior exploration angle. But *Immercenary*'s production values can't be faulted, and the imaginative touches it demonstrates from start to finish augur well for 3DO owners.







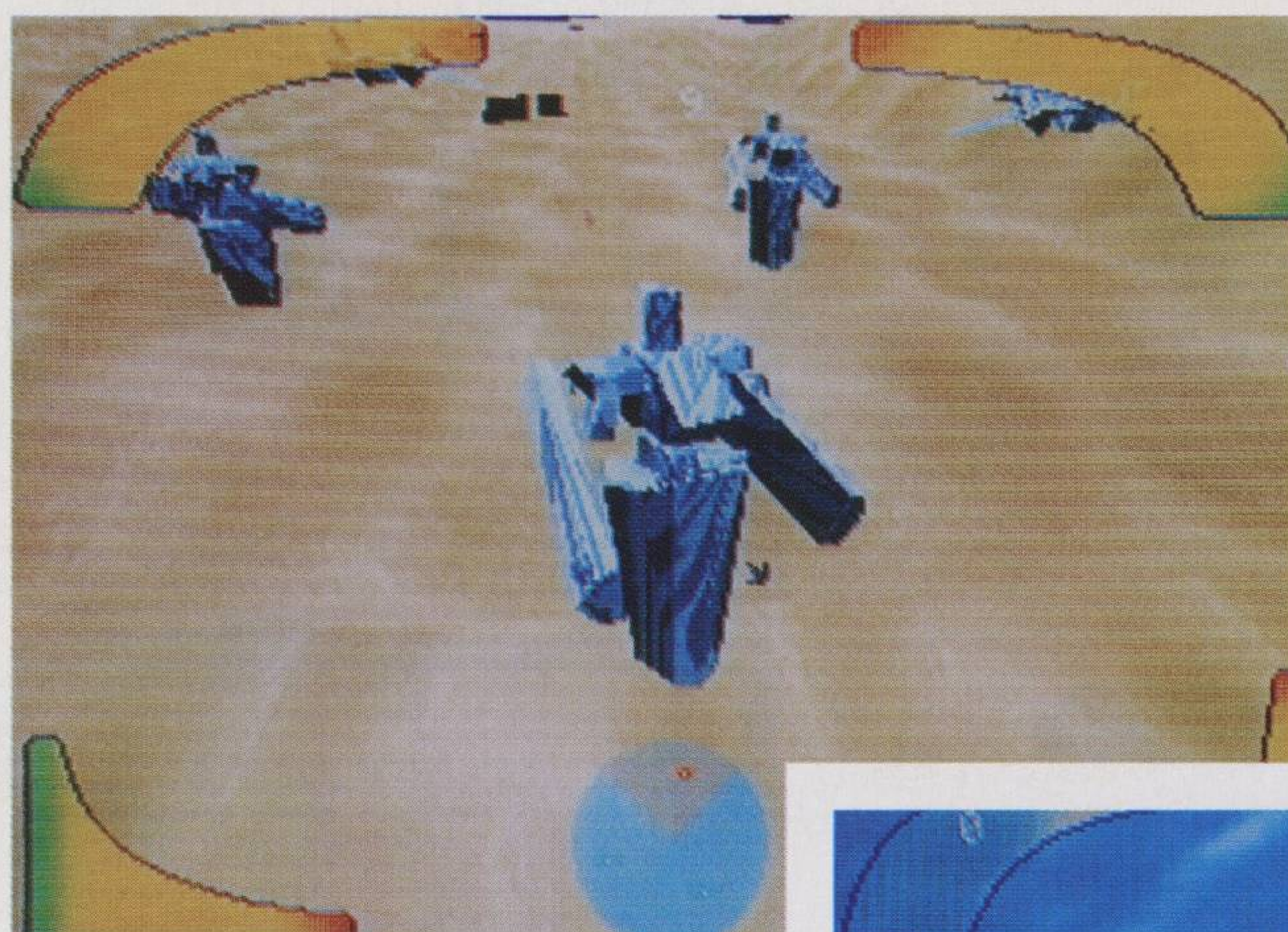


Collecting the orbs that litter the expansive play area enables you to upgrade your abilities

Extreme Power

There's heavy metal thunder in the air as the PlayStation prepares to let slip the robots of war

Format:	**PlayStation**
Publisher:	**Profile**
Developer:	**In-house**
Release date:	**July**
Origin:	**Japan**



Extreme Power **gives assault suit fans a chance to climb into their own metal jacket and indulge in some frantic blasting against a variety of enemies**



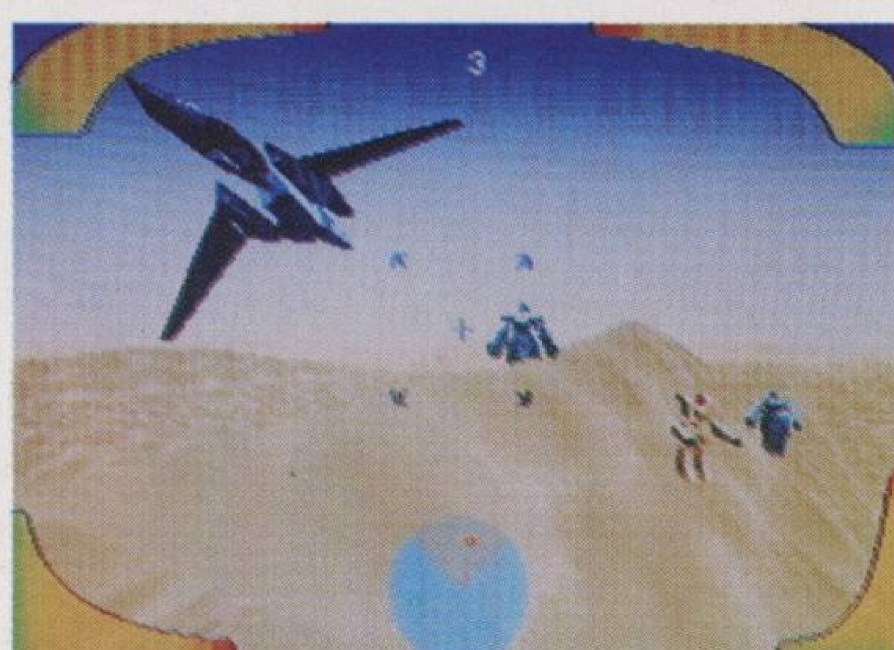
The Earth government is fighting to subdue a group of insurgent colonists who are in the process of developing a hyper-weapon

The Japanese fondness for technobots has been well-documented. Mechanised 'assault suits' have featured in numerous anime films since the 1960s and have also had their fair share of exposure in videogames – *Cybernator* and *Macross: Scramble Valkyrie* are two SNES titles that spring to mind.

The latest manifestation of this bizarre (to Western eyes) fixation is *Extreme Power*. The year is 1996 and the Earth government is fighting to subdue a group of insurgent colonists who are in the process of developing a new hyper-weapon. The player is dispatched to the war zone in his big 'bot to quash any thoughts of independence.

The graphics in *Extreme Power* play a significant role in making the game environment credible. Gouraud-shaded and texture-mapped polygons make up the majority of the scenery, through which you can walk, run and (in the later stages of the game) fly. A variety of futuristic robots, planes and fixed installations comprise the cannon fodder.

Extreme Power offers two playing modes: 'operation' and 'combat'. 'Operation' allows you to undertake pre-mission tactical planning and provides situation updates during battles. Switching to 'combat' accesses weaponry displays and opens communication channels to your wingmen. The combat itself can either



Enemy aircraft present a formidable threat







PlayStation texture mapping is now immediately recognisable (see building, top). Spectacular explosions are de rigeur in a game like this (above, middle)

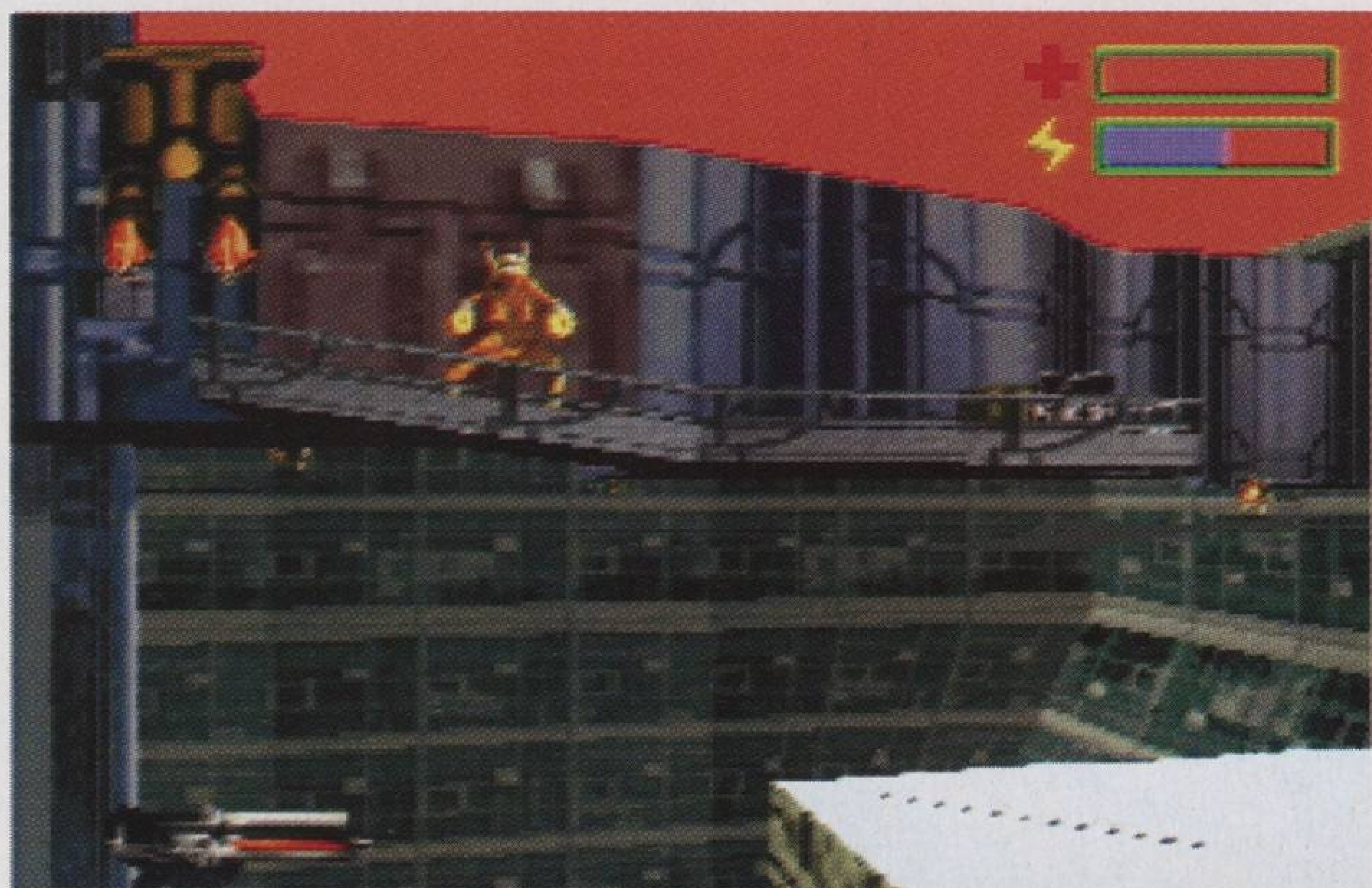
be played out in full or reduced in complexity. At the end of each mission your progress is analysed and 'money' awarded. This can be used to upgrade the specifications of your robot before you embark on the next task.

With the similarly themed *Metal Jacket* (**Edge** 18) due out in April, the stage is set for the PlayStation's own robotic rumble.



PO'ed

Its title may be something of a mystery, but *PO'ed* seems destined to take the 3DO into a brave new world of top-quality 3D blasting action

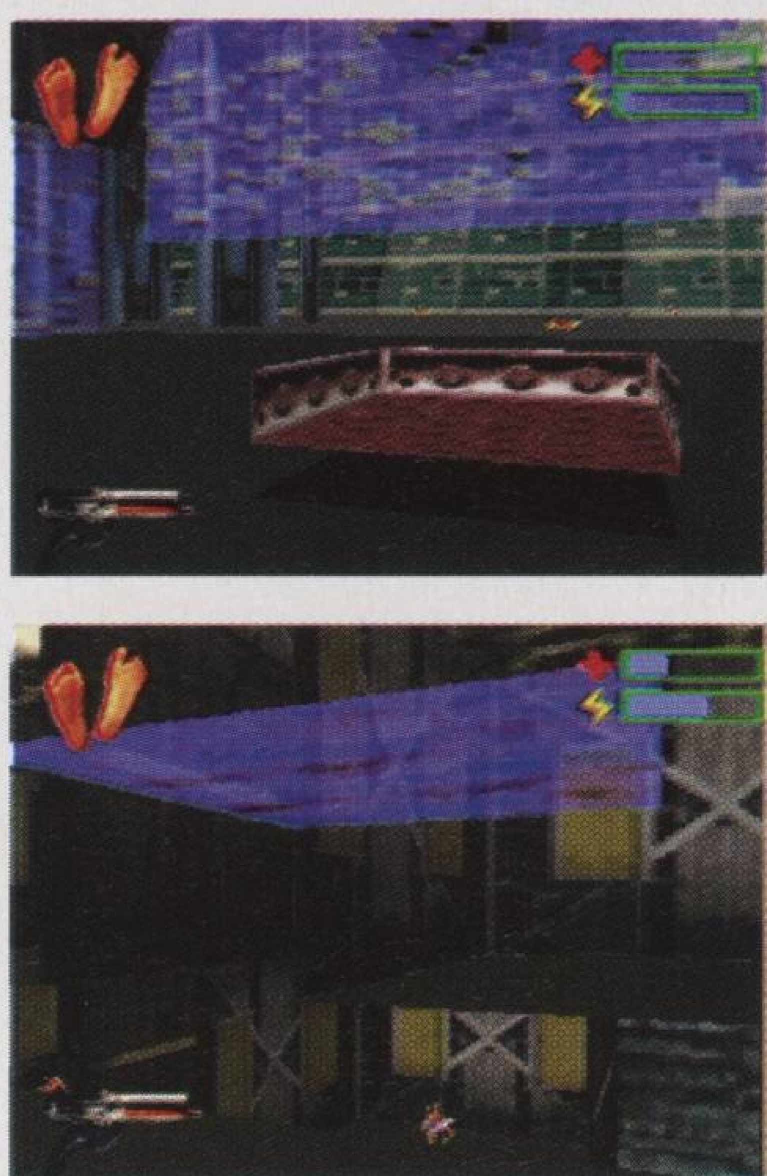


Format:	**3DO**
Publisher:	**TBA**
Developer:	**Any Channel**
Release date:	**Mid-1995**
Origin:	**USA**





Aliens attack from every angle (above and top). Stealth is an effective tactic (above right)



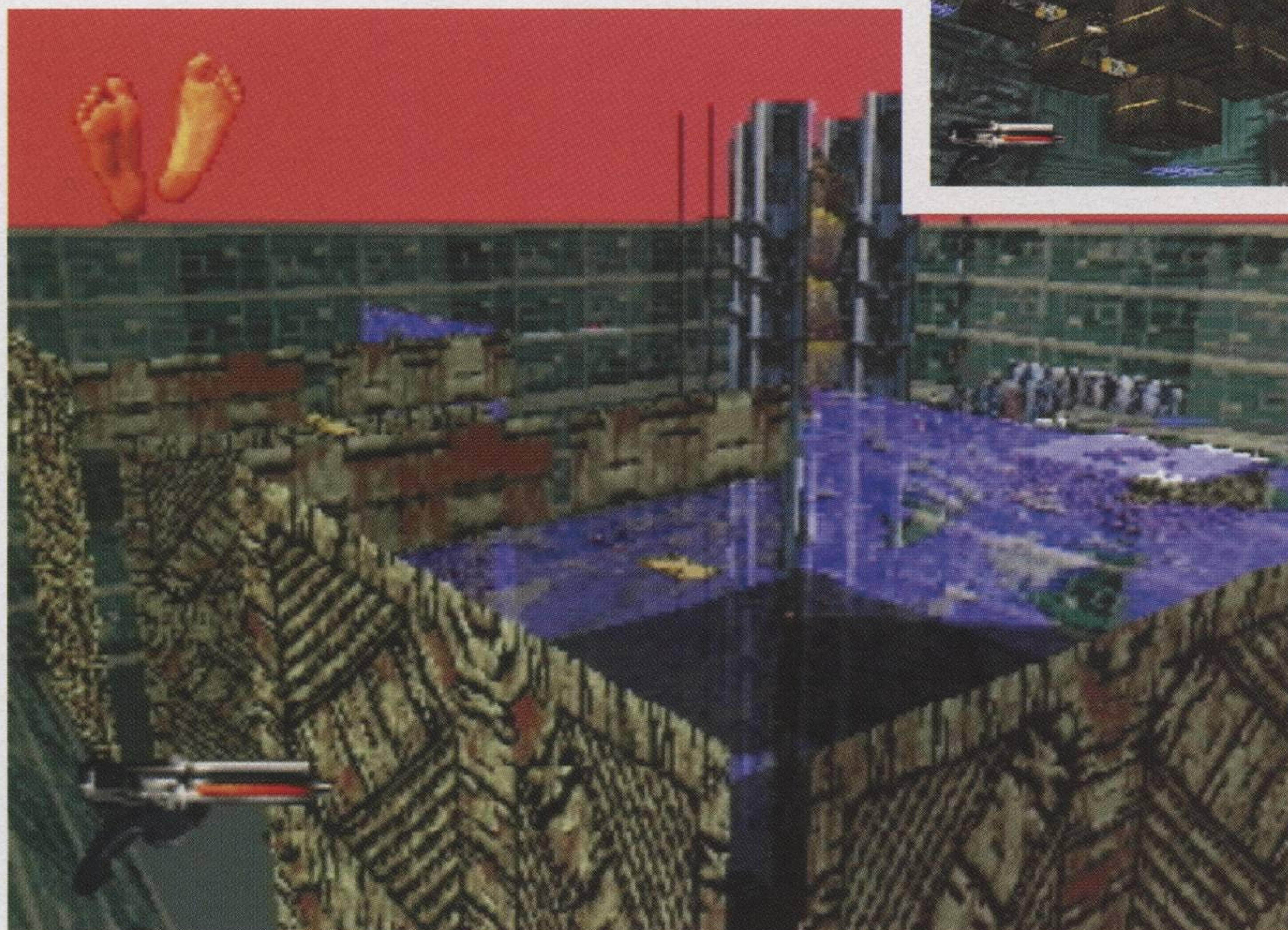
Many types of lift are installed in *PO'ed*'s buildings, ranging from simple metallic arrangements to more futuristic translucent affairs

While Saturn and PlayStation owners tend to look forward to big-name coin-op conversions like *Daytona USA* and *Tekken*, 3DO devotees generally set their sights on more original games. Together with *Immercenary* (page 36), *PO'ed* is a perfect example of software set to push the 3DO in new directions in '95.

Conceived in October 1993, *PO'ed* was at first a spare-time project, but its dramatic growth soon necessitated a full-time effort from its five-man team. And so Any Channel was born.

'We looked at games like *Doom*, *Marathon* and *Dark Forces* and took what we felt were their best elements,' says Any Channel's **Russel Pflughaupt**. 'But we wanted to get away from the tunnel-based feel of those games, so we made the environments in *PO'ed* very open, and not formulaic at all.'









The layouts of *PO'ed* provide level after level of stunning views. The finished game will incorporate 40 levels, all packed with amazingly detailed structures



On foot it's possible to use these ladders to gain access to higher levels

'If you drop into an area and find yourself getting your butt whipped, you'll be able to pull out and go in search of more powerful weaponry'

The character you play in the game is a member of a crew assigned to clean up an alien metropolis. On reaching this hostile environment, however, the entire squad (except for yourself – the ship's cook, no less) succumbs to the might of its inhabitants, leaving you to take out the aliens alone.

PO'ed has a total of 40 areas, each one set in a zone sectioned off from the rest of the cityscape. Walkways, passages and hangar-like constructions make up the game's futuristic, otherworldly architecture.

At present, the player is able to get around either on foot or by jetpack. The jetpack is, of course, ideal for moving at speed through the air, while negotiating the game's numerous multi-levelled structures on foot is facilitated by lifts, stairways and moving platforms. Unusually, the on-foot controls offer the ability to jump, often giving the game a strange but alluring 3D platform game feel.

'We originally wanted to include a motorcycle and a tank but haven't yet found a way of incorporating their use,' adds Pflughaupt. 'The level designs, due to their size, are more suited to negotiation on foot and by 'pack, but if we can get them in, we will.'

Refreshingly, Any Channel has avoided the level-by-level approach usually adopted for this type of game. 'The structure will be freeform so that you won't be restricted to hitting a level at a time in strict sequence,' explains Pflughaupt. 'If you drop into an area and find yourself outgunned and generally getting your butt whipped, you'll be able to pull out and go in search of more powerful weaponry.'

With *PO'ed*, Any Channel is cooking up a tasty mix of exploration and blasting. Its looks alone are likely to win it fans: there are few games that can match the beautifully fantastical flavour of its real 3D environments. And it's definitely got the right idea: let's face it, blowing away aliens with high-powered weaponry in 3D is never going to be a chore. 

Heart



Of Darkness

The latest product of France's pioneering games industry is more than just another sprite-based platformer. **Edge** talks to the creators of the visually seductive *Heart Of Darkness* on the eve of its début

prescreen

***Heart Of Darkness* is a sinister adventure combining platform-style gameplay with superb animations and breathtaking cut-scenes. The game starts with Andy running away from school (above)**



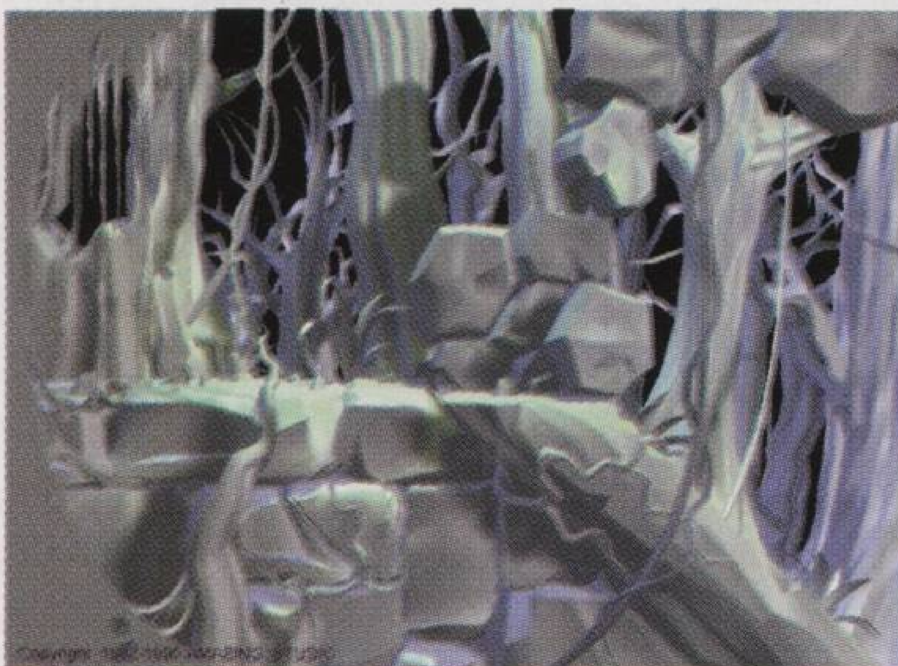
The 12-strong Amazing Studio team – headed by Frédéric Savoir (far right) and Eric Chahi (front row, third from right) – has spent the best part of three years working on *Heart Of Darkness*, its first project

Frédéric Savoir and Eric Chahi are tired. They haven't slept during the last 48 hours and are unlikely to get much kip during the next 48. They finished burning a demo CD in Paris at 6:31am, caught le Shuttle at 6:45, arrived in London at 10:45 and have been involved in fraught recording-studio sessions ever since. It's now 4:20pm and they're bouncing through the back alleys of Soho in a taxi as **Edge** quizzes them on the reason for their hectic schedule: *Heart Of Darkness.*

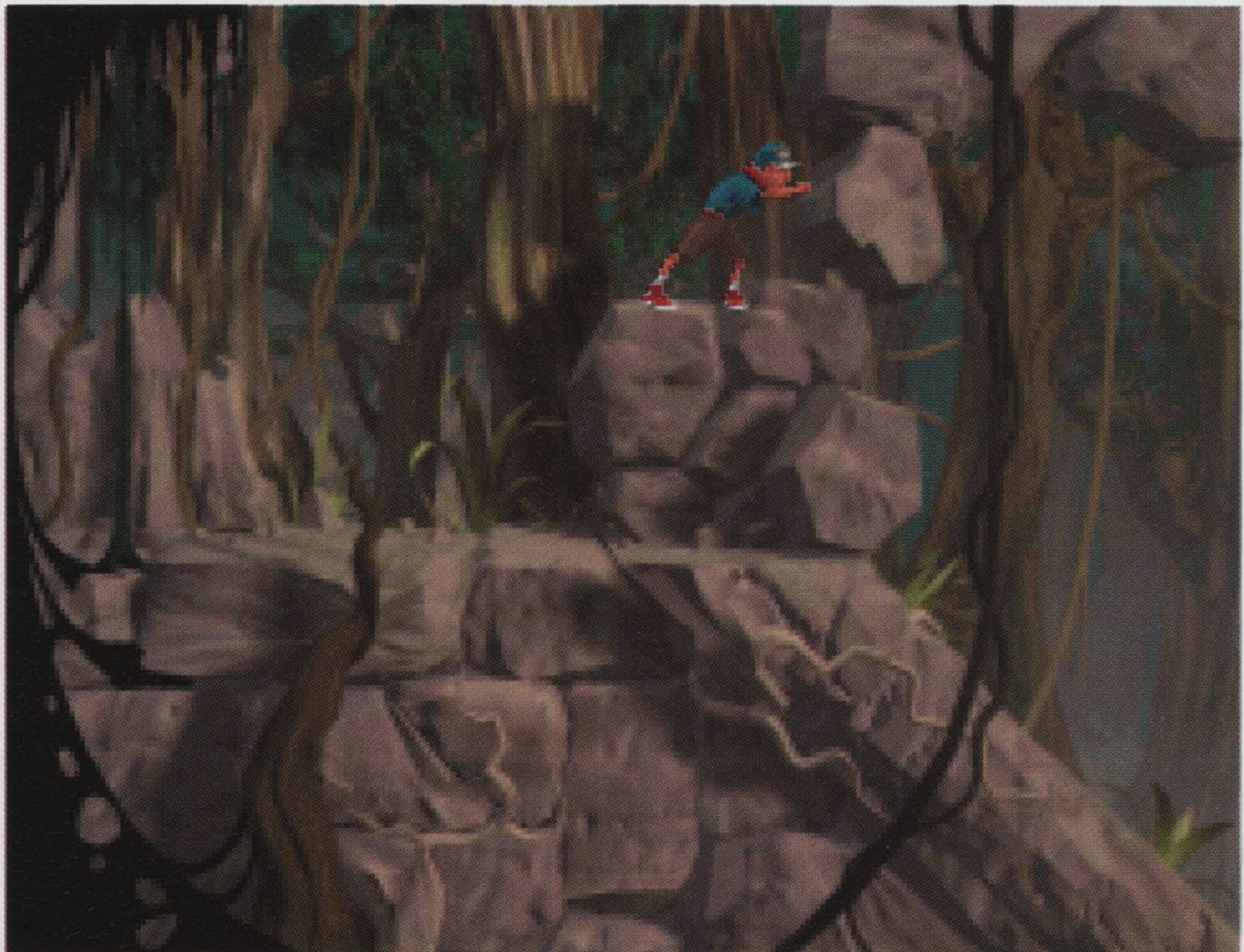
Heart Of Darkness is a game that has been shrouded in near-military secrecy since its inception in 1992. Apart from a sneak peek in **Edge** 14, nothing has been seen of the game by anyone outside Amazing Studio and Virgin. It's taken three years for it to reach this stage, but now *Heart Of Darkness* is due to be publicly unveiled at ECTS in just a couple of days' time.

All this secrecy could, of course, just be a standard marketing ploy. Except that the creators of *Heart Of Darkness* are among the world's most respected games designers (quite an





Most of the scenes in the finished game are remarkably faithful to the original sketches (top), created up to three years ago. Unusually, Amazing used *3D Studio* rather than an SGI setup to render the backdrops (above)



After the initial basic rendering, detailed textures are added to the scene (above). Every screen has up to six 'layers' of character movement, so sprites can pass in front of each other. Pressure points initiate CD sequences: here, Andy pushes the rocks forward, causing them to tumble down the slope

achievement for a French programming outfit). Frédéric Savoir was the lead coder on the original version of *Flashback*, and Eric Chahi was almost singlehandedly responsible for the legendary Amiga game *Another World*. *Heart Of Darkness* could be described as a convergence of those titles. Amazing's aim was to take the platform game to a new level of sophistication; many people think they have succeeded.

'I had no idea it was going to be this great,' beams **Jon Norledge**, the game's producer for Virgin Interactive Entertainment. 'We met for the first time at ECTS in April 1992, but I couldn't imagine three years ago what it would turn out to be.'

This kind of praise is, of course, to be expected from a producer anxious to talk up his product. However, those involved with the project do seem genuinely enthusiastic, to a degree unusual even in the excitable games community. Having seen it, **Edge** can understand why.

The graphics in *Heart Of Darkness* work so well that even the most clued-up observer is unlikely to notice the programming mechanics behind them. The main character, Andy, alone draws from a pool of 1600 frames of animation in one direction (most cartridge games have around 1200 in total). To handle them, Frédéric created a complex game editor whose primary function is to ensure a seamless transition between the various types of movement.

Every frame in the game has a 'cause and effect' list. This strictly governs the change from one set of animations to another and pre-loads all possible 'next' frames into RAM in case they're required. For example, when Andy is running along, the 16 standard running frames are stored in sequence in a loop. If he jumps, the pre-loaded table calculates which frame of the run he is currently on and instantly switches to the applicable frame of the jumping animation. This avoids *Another World*-style stop/start blips which could break up the action.

'It's an action adventure,' explains Frédéric. 'The player can jump run, fire, swing, shoot, swim and climb. But we don't want jerking when a player switches from one to another. The player must be in control all the time.'

The game also features 27 minutes of pre-rendered animations which, to avoid any access delay,

The fullscreen pre-rendered sequences feature animations that look more like the product of a Disney studio than that of a gamehouse

are stored in memory as you play. This required an inhouse solution to data compression, created by Daniel Morais. His system is specifically designed to retain the minute details that give the

Continued next page

prescreen

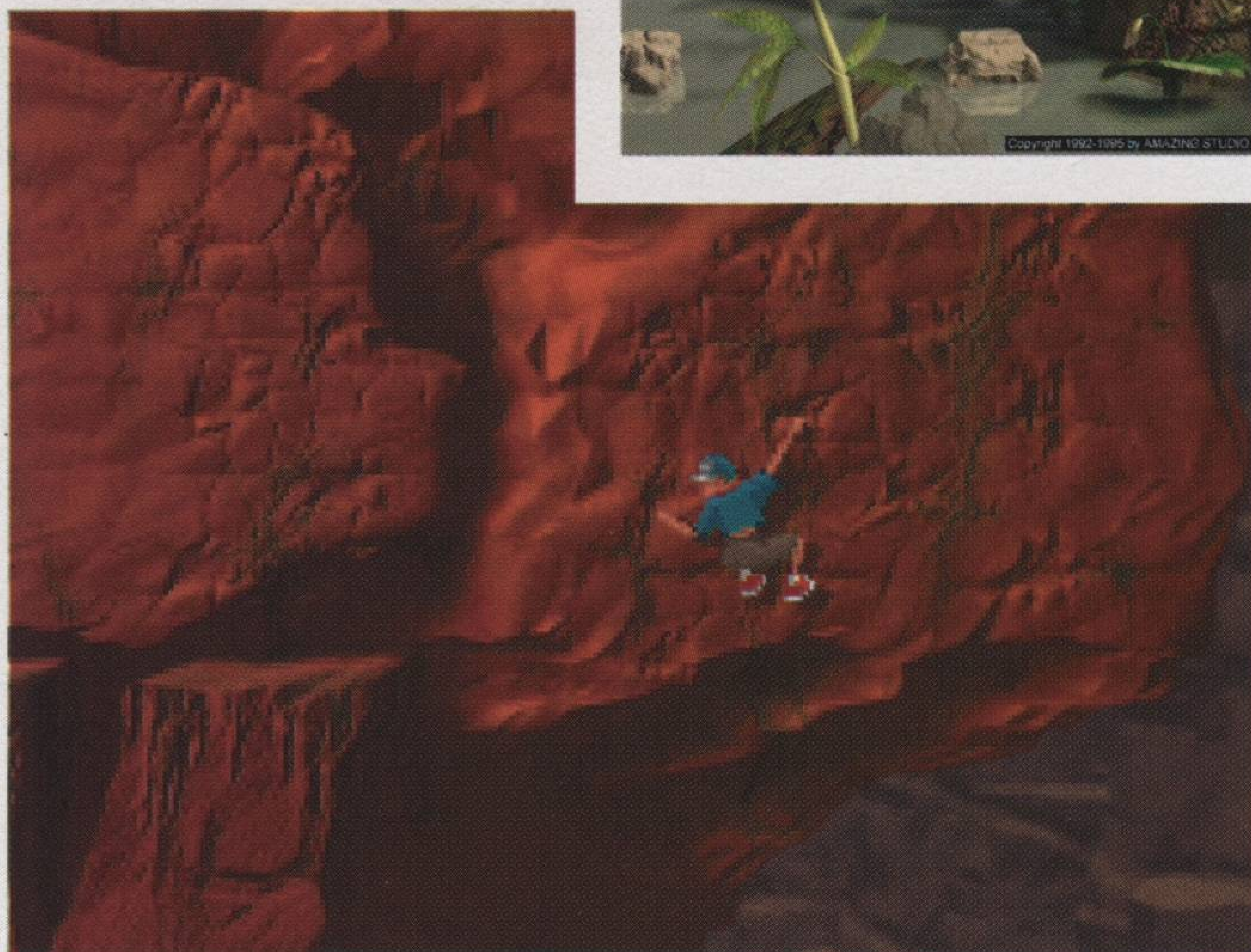








Pascal de France was responsible for the fact that every object and character casts realtime shadows on the backgrounds – or, as here, rippling reflections on water. This scene started life as a drawing, which was rendered and then textured (far right, top three pictures)



Andy shins along a rock face, swinging from hold to hold. All the backdrops were pre-rendered and then had the game logic superimposed on them using the editor developed by Frédéric Savoir specifically for the project

Continued

animations their lifelike appeal – many commercial compression programs jettison this detail.

The pre-rendered sequences – which run fullscreen at 256x192 with 256 colours on a 486/33 PC with only 4Mb of RAM, and clock in at 10fps – feature animations that look more like the product of a Disney studio than that of a gamehouse. Their strength is due to one principal factor: character design. Each character, from Andy, to the sinister Master Of Darkness, to the humorously repulsive Blob, has a well-defined personality. They're impressive enough when motionless, but when animated they're simply breathtaking. With *Heart Of Darkness*, Amazing has upped the ante, and its competitors will have a tough time catching up.

What makes the cut-scenes even more remarkable is that they were rendered using *3D Studio* rather than a high-priced Silicon Graphics setup. 'We thought about using Silicon Graphics and we tried them,' says Eric Chahi. 'But they're expensive and so is the software. They are very good but when we tested them [end of 1993] they were full of bugs and for the price that is unacceptable. We'd already started using *3D Studio* and so it was quicker to carry on rather than start over.

'We'd never used any 3D packages before. It wasn't easy – it's a laborious and painstaking process – but it's never boring because of the results. When a new scene has been finished, other members of the team gather round and admire the work. There's an excitement in the office you rarely find with 12 people.'

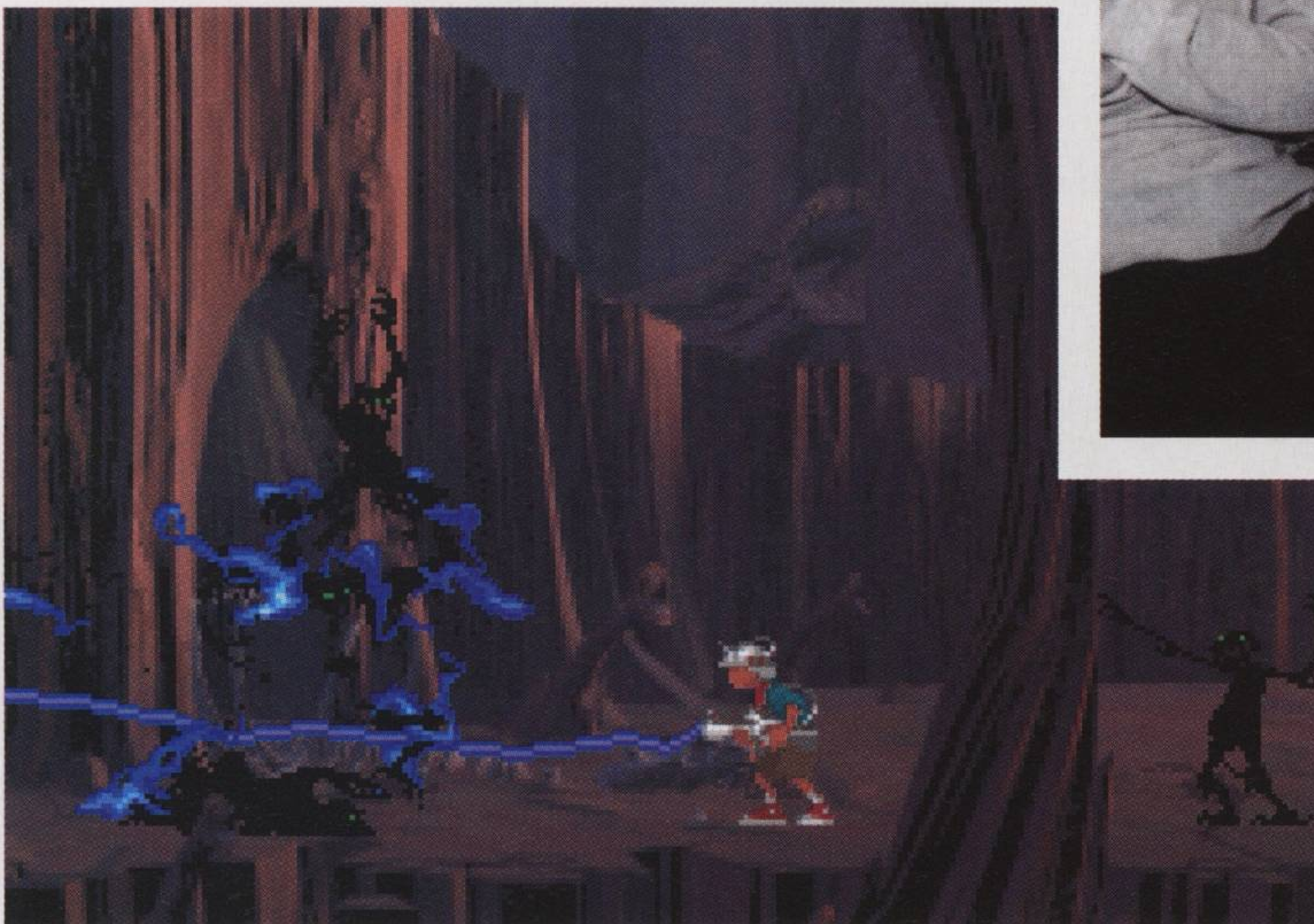
Despite the absence of SGI gear, Amazing had some pretty hefty kit at its disposal. 'We started using a 486 DX2/66 but



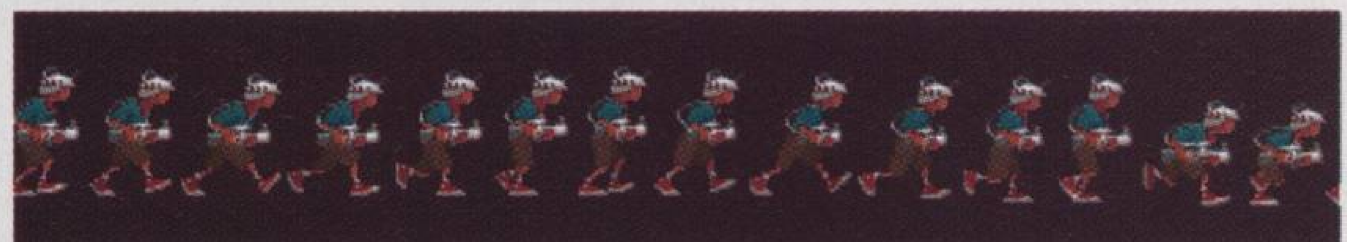
This malevolent-looking individual is Andy's teacher, who drives him out of the classroom at the beginning of the story. His cruel and vindictive nature is pivotal to the plot







Andy can jump, run, fire, swing, shoot, climb and even swim (top), all without breaking into a sweat. Amazing went to great lengths to preserve animation continuity, not only for Andy himself but also for minor characters like these spectres. This attention to detail is evident throughout the game







Even Andy's most basic moves use a huge number of frames (above). Amazing has proved that sprite-based games still have potential. The return to traditional animation techniques will no doubt be welcomed by many platformer devotees. Team members Stéphane Hamache, Jérome Combe and Christian Robert (top, left to right)

now we're onto a 90MHz Pentium with 64Mb RAM,' says Eric. 'We'd like to use more but the PC doesn't recognise it. It's beginning to become very expensive to buy the memory!'

The end seems to have justified the means. Amazing has confounded the cynics by producing *3D Studio*-generated images that actually look unique. The leading PC rendering package has become such a widely used tool in the industry that many games have a recognisable *3D Studio* 'look'. Frédéric and Eric were determined to make *Heart Of Darkness* different. 'We don't want our graphics to look like computer graphics – they're too clean for us,' asserts Eric.

To avoid the blandness of conventional *3D Studio* images, Eric and Chris Delaporte created all the *Heart Of Darkness* textures themselves instead of using the supplied texture maps to which most developers limit themselves. The team then added 'noise' to the signal to create extra realism.

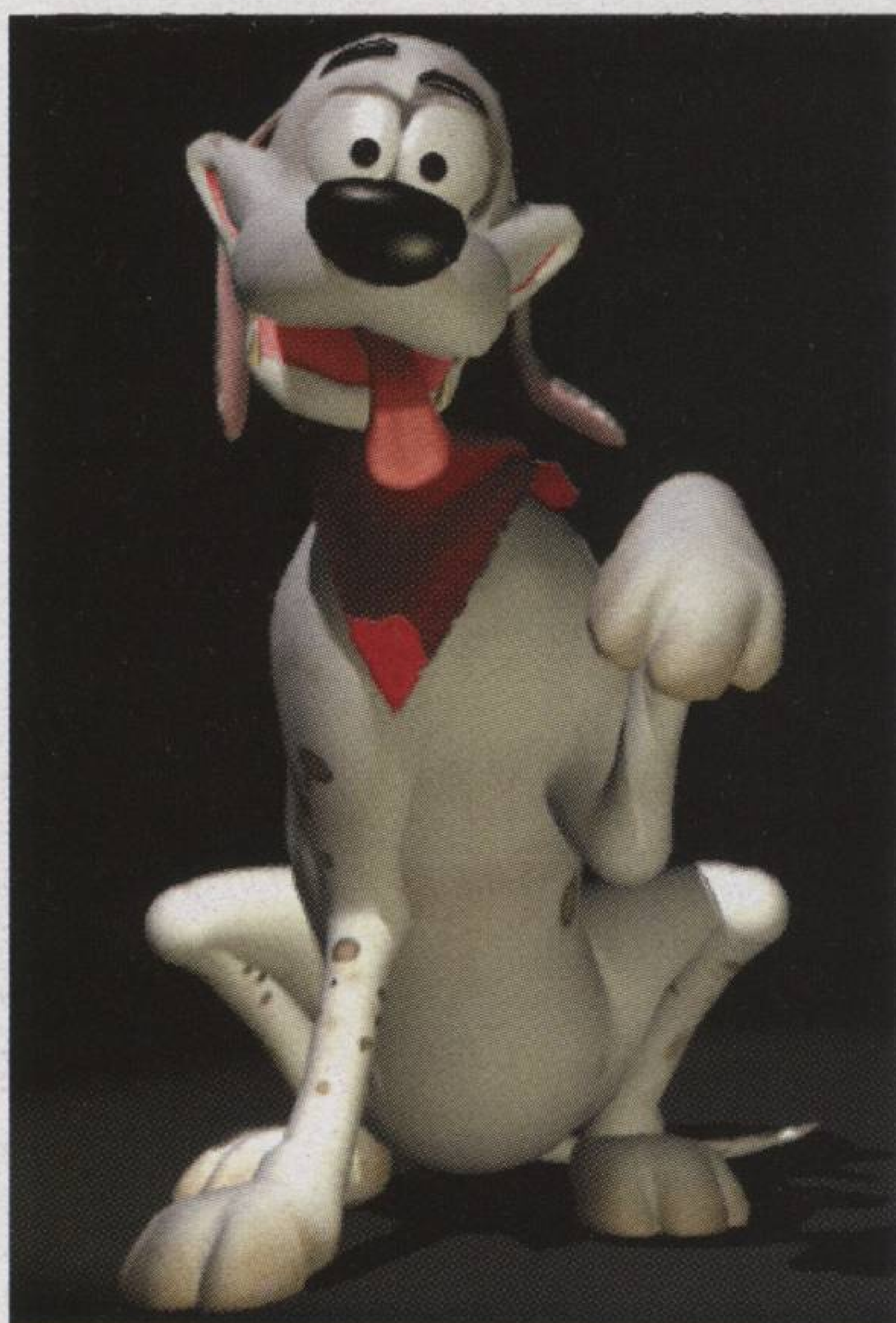
'It's not like merely watching a spacecraft docking and going "Wow, that's beautiful", like many programs are,' explains Jon Norledge. 'It's not using 3D graphics just to show pretty pictures. It's telling our own story.'

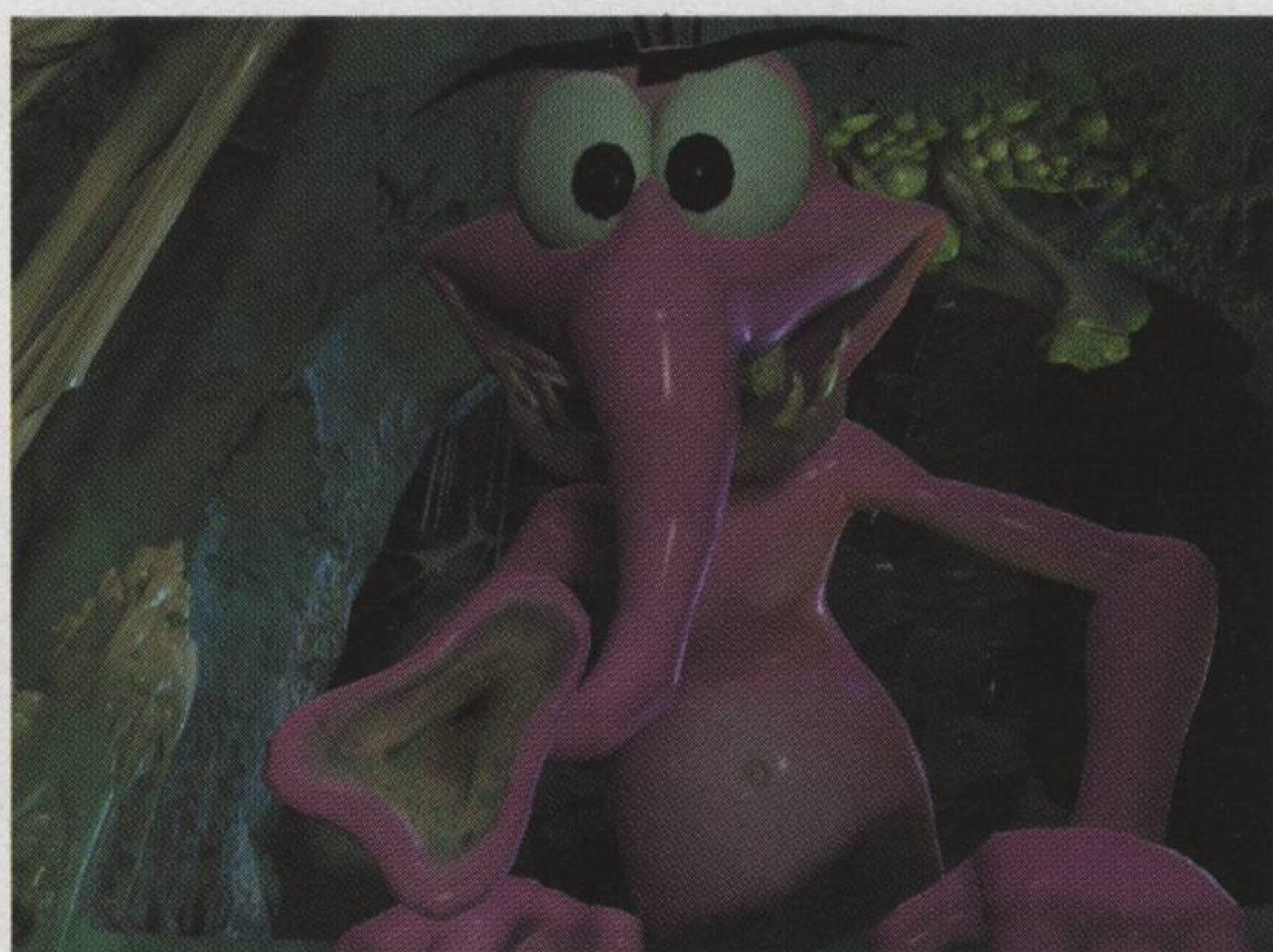
And it's a carefully crafted story. Amazing Studio spent the first six months of *Heart Of Darkness*' development process constructing intricate plans of every character, background, animation and level. ('I've got maps of every single level in the game which date back over two years – and hardly a screen has altered since then,' claims Norledge.)

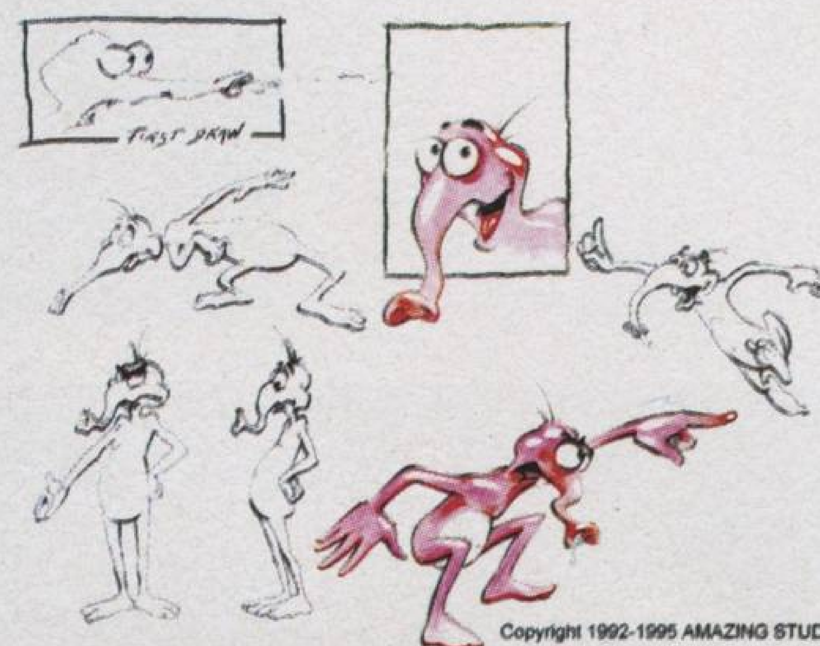
In each of the game's 256 screens, the player has the ability to interact with everything that's visible – it's not just a question of shooting other characters. Shadows are calculated and distorted in realtime, and rippling reflections are created when Andy moves over water. Objects can be picked up and used when they're needed – although there's no set order in which you

Titles like *Another World*, *Little Big Adventure* and *Heart Of Darkness* are evidence of the alarming concentration of talent across the Channel

Continued next page









HOD's appeal is largely due to Christian Robert's charming character design. Here, Andy and his dog, Whisky, gaze skyward at the disaster about to befall them





The Blob's drooling, nasal voice is one of the highlights of the game



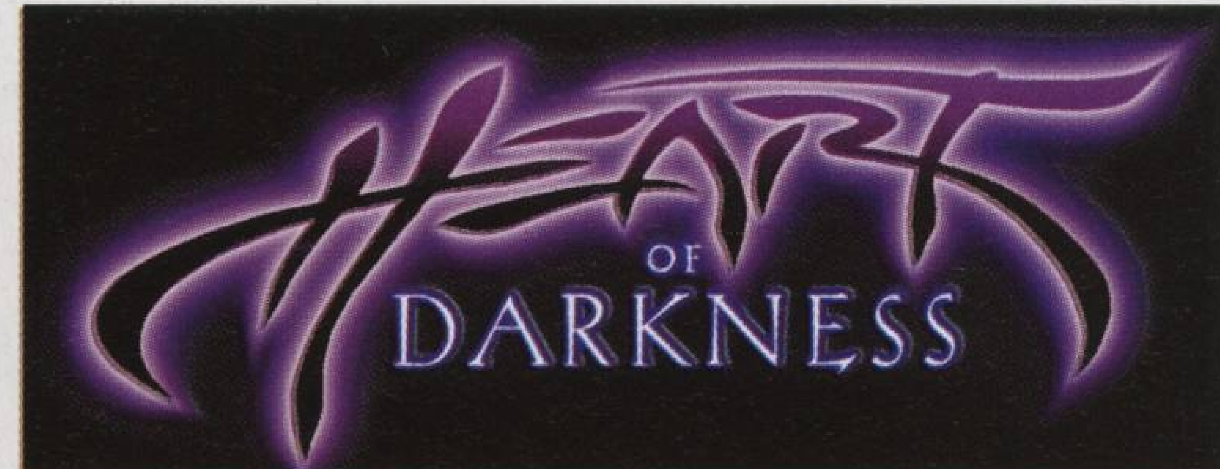
Lead 3D animator Fabrice Visserot created much of the 3D animation in *Heart Of Darkness*. He was assisted by Jérome Combe, Patrick Daher and Stéphane Hamache

have to collect them. How long it will take to complete the game is still uncertain, but Frédéric hopes that players will return to the game time and time again, lured by the seductive visuals.

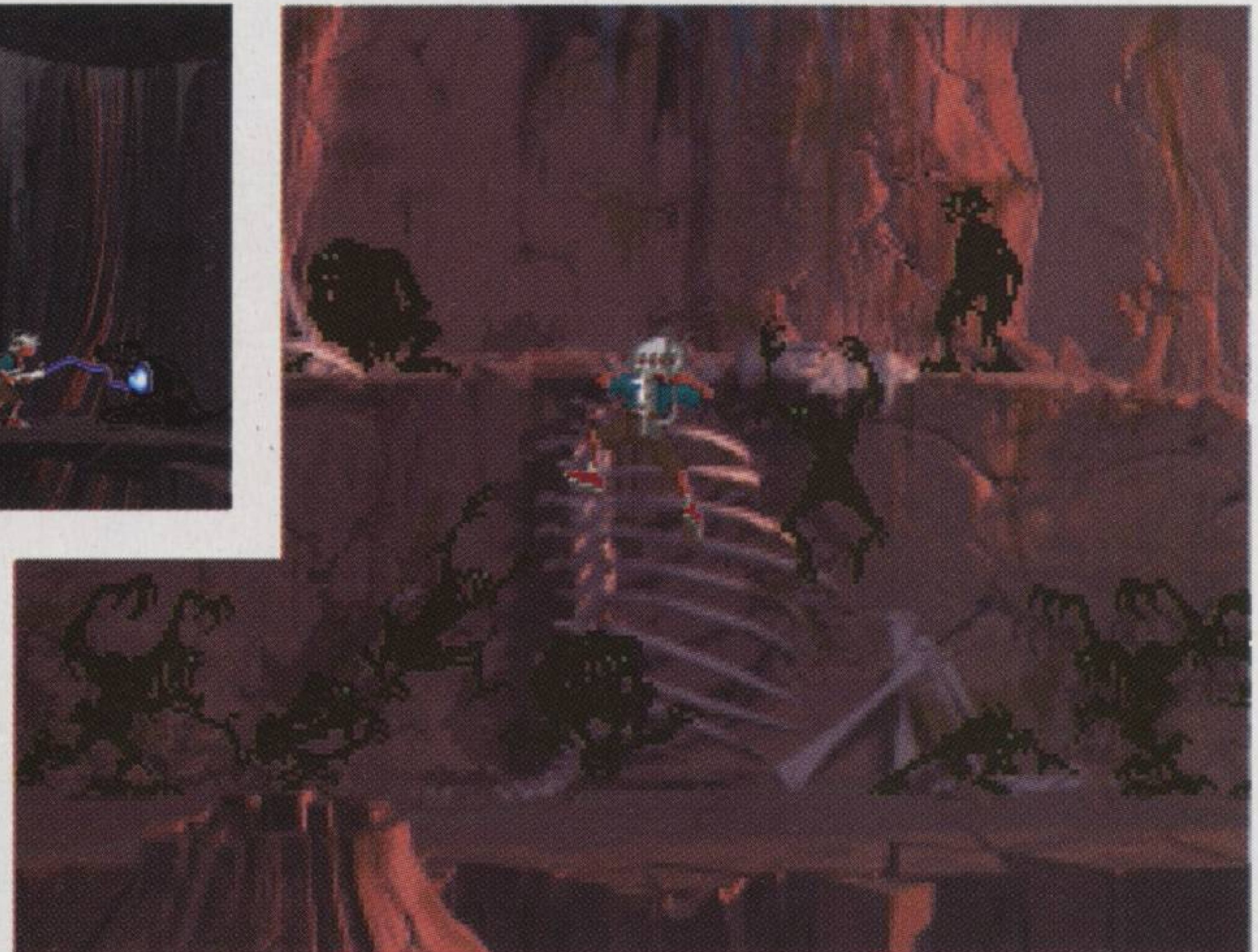
Those visuals are perfectly complemented by the game's aural components. The pre-rendered sequences feature 22KHz 16bit stereo sound interleaved with the graphics. Sound is perhaps the only aspect of *Heart Of Darkness* that wasn't planned to the last detail years in advance. Although a script was needed for rough lip synchronisation during rendering, it still hasn't been determined which actors will provide the final dialogue. The finished game will be released in French, English, German and Japanese, and different voices will obviously be required for each version (Amazing is currently working with a London-based production team on the English dialogue). Some big star names are being bandied around by Virgin for speaking roles in the game, but no final decisions have been made yet.

Strangely, considering that they've just spent most of the last three years working on an innovative new method of sprite animation, Eric and Frédéric don't believe that sprites represents the future of videogames. 'Realtime 3D is the way forward,' Eric states firmly. However, the duo reckon that the mixture of 2D gameplay and 3D cut-scenes in *Heart Of Darkness* works well (although, as









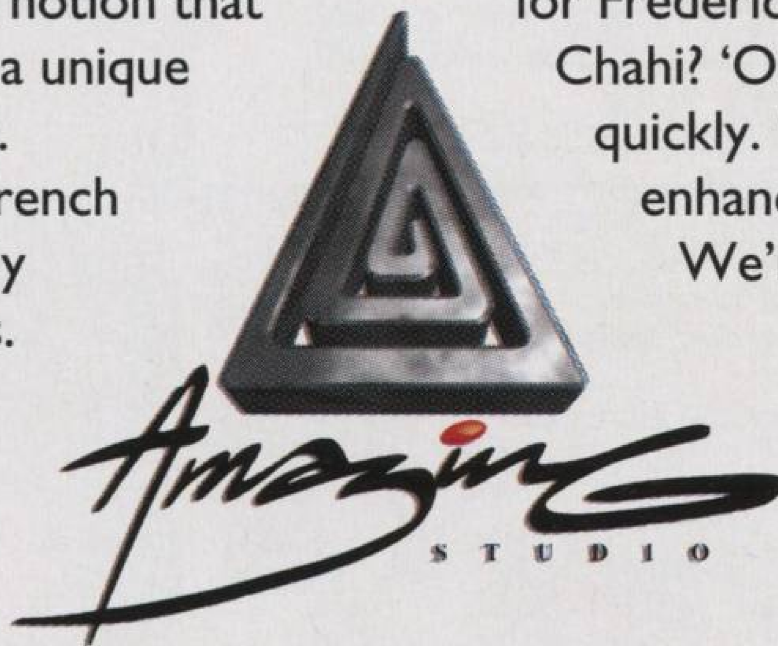
Andy is surrounded by spectres and tries to escape by clambering up a dinosaur ribcage (above). Note how every character casts a shadow which is distorted according to the surface on which it falls



Negotiating each of the 256 screens requires a variety of tactics. Locating objects, storing them and using them later is a crucial part of the gameplay

Frédéric accepts, 'It's hard to do both well').

Eric thinks the notion that French games have a unique style is exaggerated. 'I don't think that French games are inherently different,' he argues. 'There's no French style per se. It's different styles of different software houses.'



Be that as it may, titles like *Another World*, *Little Big Adventure* (**Edge** 17) and, now, *Heart Of Darkness* provide evidence of the alarming concentration of talent across the Channel.

So, does *Heart Of Darkness* represent a major step forward for Frédéric Savoir and Eric Chahi? 'Oh yes,' they both say quickly. 'Each time we enhance the techniques. We're always aiming for more playability, for better control. We'll start playtesting *Heart Of Darkness* soon and that's vital. It's all about the way you feel – is the game nice to play or not?'

That, of course, is the crucial question. If the gameplay matches the obvious quality of the visuals, Amazing will surely have a major hit on its hands.

Credits

Main team:
Eric Chahi
Frédéric Savoir
Christian Robert
Fabrice Visserot
Daniel Morais

Additional team:
Pascal de France
Jérome Combe
Patrick Daher
Stéphane Hamache
Chris Delaporte
Jean Frechina
Francis Piérot

Music: Bruce Broughton
Sound editor: Patrice Grisolet
Sound designer: Eric Mauer
Foley artist: Alain Levy
Executive producer:
Jon Norledge



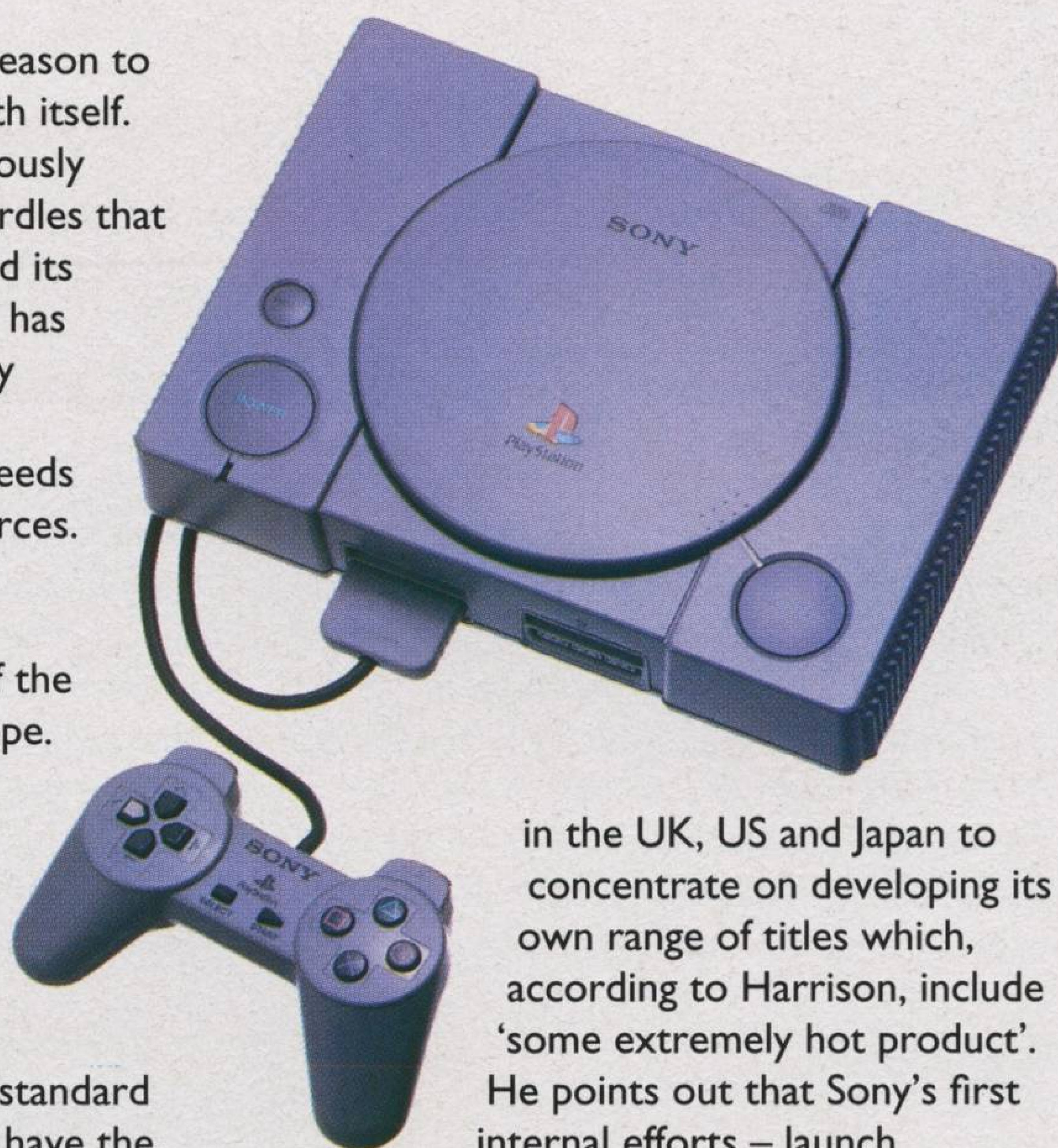
Amazing's Paris headquarters. A real buzz of excitement pervaded the office as *Heart Of Darkness* neared completion. Release is scheduled for fourth quarter, 1995

Digital

Sony has gone to great lengths to ensure that producing PlayStation games is as hassle-free as possible. Has it succeeded? **Edge** ventures into the twilight zone between hardware and software to find out what it really takes to make the PlayStation perform

disciples

Sony's PlayStation gameplan



Sony has good reason to feel pleased with itself. Having meticulously avoided the hurdles that have obstructed its competitors, it has arrived in the videogame industry with a clean slate and a healthy measure of respect. Now all it needs is commitment, talent and resources.

With a successful Japanese launch behind it, Sony is now preparing for the introduction of the PlayStation into the US and Europe. And while the Sony brand name will guarantee it some credibility in the high street, its success will ultimately depend on having a wide range of outstanding software. As Sony's failed Betamax videotape standard proved, it simply isn't enough to have the best technology. For the PlayStation to be a success, it needs the cream of the world's development talent behind it. And that's exactly what Sony has been working on.

Phil Harrison is Sony Computer Entertainment's European PlayStation evangelist. Since September 1993 he has spent most of his time convincing developers throughout Europe and (to a lesser extent) in the United States of the merits of Sony's games platform. And it hasn't been time wasted: there are now over 100 licensees in Europe, with another 120 in the United States and – most impressive of all – over 250 in Japan. On top of this, Sony has set up internal teams in the UK, US and Japan to concentrate on developing its own range of titles which, according to Harrison, include 'some extremely hot product'. He points out that Sony's first internal efforts – launch underperformers such as *Motor Toon GP* and *Crime Crackers* – are 'not indicative of the products that are coming down the line'.

Although Sony claims a profound commitment to internal development, it has so far counted mainly on the expertise of a few Japanese thirdparties, and even allocated its internal resources to help external programming teams complete titles in time for the launch. *Ridge Racer* was a prime example: to enable Namco to understand the technology and get to grips with the preliminary libraries (many were still being written when work on the game began), Sony assisted the company with

Continued next page

PlayStation developers

Continued

some intense technical support from Ken Kutaragi's R&D division – the team behind the development of the PlayStation hardware. According to Sony, the experience gleaned from those few hectic months is now available to all developers.

Sony's philosophy has been developer-driven from the beginning. When the PlayStation technology was being developed in Japan, the company was receptive to the opinions of the people who would be programming it, and this policy continued when the machine was touted around Europe.

'When we first came to the European developers a year before the launch, the spec was decided with the exception of the amount of RAM,' says Harrison. 'The bottom line was that they said they could make better games with an extra megabyte, and so we gave it to them. Since then, the decision has been more than vindicated by the quality of the product.'







Tamsoft, the Takara in-house team behind *Toh Shin Den* (left), has a sequel in the works for late '95. Takara's Toshiro Morioka (above right). The company's Aoto HQ (right)

producers and project managers who work closely with thirdparties. This approach is in stark contrast to the isolated approach of Sega and Nintendo, and is seen internally as one of the catalysts behind the development of games like *Ridge Racer* and *Toh Shin Den*.

Phil Harrison believes that Sony's emphasis on developer assistance will reduce the most time-consuming aspects of

'It's tempting to be completely committed to the PlayStation, but the PC is like a rock. When we got our PS-X development station it took us two weeks to port our PC code and only another two weeks to achieve a four-fold speed increase'

Peter Molyneux, Bullfrog Productions

The size of Sony's developer base can largely be attributed to its efforts to make game production as streamlined possible. As well as providing a wide range of programming libraries which are constantly updated and available on-line, Sony Computer Entertainment's HQs in London, California and Tokyo house thirdparty technical support teams together with

product development: 'Historically, if you look at the development schedule – let's say 12 months – about nine or ten months is spent making the game work in terms of the technology. If it's a driving game, it's getting the driving bits up and running. If it's a shoot 'em up, it's getting all the sprites moving about the screen, and you add gameplay in the last two months. The difference with the PlayStation is that you can use the built-in 3D hardware relatively easily, thereby diminishing that amorphous ten months of, "I'm working on it, honest, I've got lots of code written but you can't see anything yet."'

While 3D is the uncharted territory that most developers are keen to explore, there remains a powerful 2D sprite engine inside the PlayStation that could get neglected. The first 2D PlayStation software attracted complaints from new adopters because of its visible sprite slowdown – although Sony attributes such mishaps to programming teething troubles. (For a glimpse of some experimental programming, check out Konami's second *Parodius* game, *Ultimate Parodius*, which uses the PlayStation's hi-res mode and suffers badly in the speedier sections where the programmers haven't been able to double buffer the screen.) Encouragingly, though, most of the developers **Edge** spoke to said they had plans to develop games using the machine's 2D potential in some form, and they were impressed with the tests they had done. 'There are some games in development that genuinely exploit 2D in some interesting and innovative ways,' claims Harrison.

One area of doubt that still exists, though, is the PlayStation's chosen storage medium. While the system's CD drive is fast and loading times often insignificant the danger exists that developers will abuse the format, as seen all too often on the PC. Early Japanese games like *Kileak The Blood* show the potential for pre-rendered MDEC video playback to enhance the

Virgin

Virgin has a healthy commitment to the PlayStation, with around ten titles currently in the pipeline in the UK and US. These include *Hoopz* (a basketball game developed in the US); *Tilt* (a pinball game from NMS), Papyrus' *IndyCar Racing* and *Nascar Racing*, and, possibly best of all, a stunning new version of *Cool Spot*.

The game's programmer, **Mark Kelly**, comments: 'The libraries are fairly strong and have a lot of work done for you, and the development environment and CD system work really well. Overall, good job Sony.' Some of Virgin's PlayStation titles will be on show at E³ in May.



The PlayStation's so far little-used 2D abilities are exceptionally well handled in Virgin's forthcoming isometric platformer, *Cool Spot*. The game is being handled in-house in the US

gaming experience, but there are still too many companies out there who are more concerned with filling a CD than making a playable game.

'Personally, I don't like CDs,' confesses Bullfrog's **Peter Molyneux**. 'They make everyone approach game design in a similar way – it's often seen as a big pot to fill.' The reality, of course, as Sony itself admits, is that 'you don't have to fill a CD to make a compelling game.'

Perhaps the most ingenious move on Sony's part was its decision to use the PC as a development platform, enabling it to call on the skills of a huge number of developers. Licensees now receive a pair of full-length ISA cards that plug into a normal PC. These two cards contain the entire PlayStation chipset, as well as extra RAM and some logic to enable them to talk to the PC. 'It's great having the system inside the PC,' reckons Peter Molyneux. 'With most bulky console development systems it sometimes feels like you're surrounded by NASA control.'

Such technology doesn't come cheap, though. PlayStation developers need to cough up £12,000 for the full system (which Sony is adamant it doesn't make money on), although all subsequent software tools and hardware upgrades are free.

But the decision to embrace the PC as a development platform has wider ramifications. Rather than promote a

'We've yet to see how the restrictions on RAM, compared to the bucketloads you can have on a PC, reflect in the game. We'll have to be cleverer in the way we organise RAM'

Ian Turnbull, Ocean Software

PlayStation-only development path, Sony has seen the advantage of capitalising on the crossover of product between the two platforms. The vast majority of non-Japanese developers are focusing on both formats (in Japan the IBM-compatible PC has a small following).

'It's very tempting to be completely committed to the PlayStation,' admits Molyneux, 'but the PC is like a rock. When we first got our PS-X development system, it took about two weeks to port our PC

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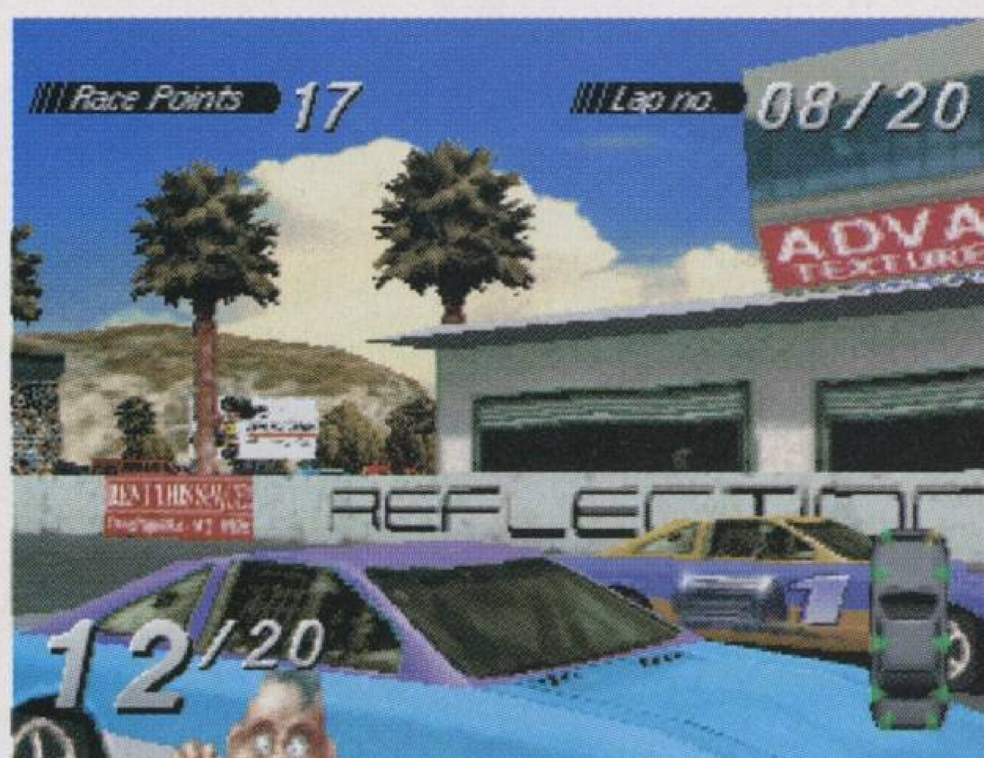
Psygnosis: early adopters



Psygnosis' new headquarters near Liverpool will soon become home to some 300 full-time staff, increasing to 500 in the next six to nine months. Satellite development teams in Chester and Stroud will stay put while the staff from the three Liverpool offices will merge to create the largest PlayStation development installation in Europe.

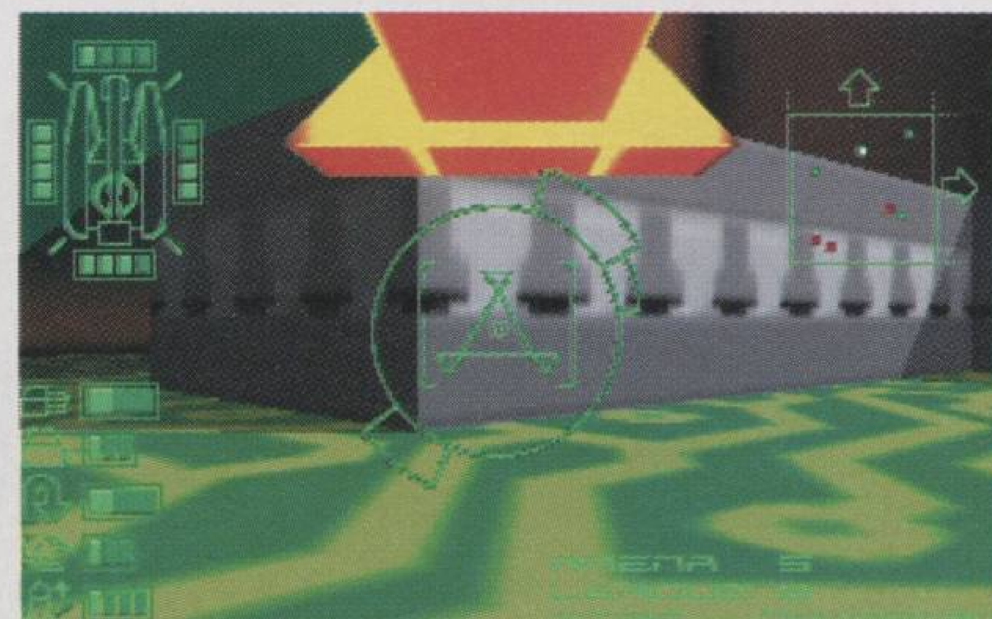
The Sony-owned company has ten titles planned for release between launch and January 1996, with an average of 12 team members per project.











Psygnosis' initial PlayStation line-up (clockwise from top right): *Wipeout*, a flying/racing game with head-to-head linkup facility; *Ideal* (working title), a mobile suit combat simulator; *Assault Rigs*, a futuristic sport game; *G-Police*, featuring an enormous realtime 3D city environment; and *Demolition Derby*, a stunning circuit driving game by ex-Amiga coders Reflections

PlayStation developers

code over to it. However, it only took another two weeks to optimise that code, which brought about a four-fold speed increase on the PlayStation.'

Of course, the PlayStation does have a few restrictions, and PC developers like Bullfrog are the ones most likely to cite them. Peter Molyneux again: 'With Bullfrog's games our main game loop is often burdened with non-graphics calculations, because we're often simulating realtime environments. In this case the main processor [a 33MHz MIPS R3000] isn't quite so bullish compared to a fast PC. And the lack of RAM can come as a shock.'

This is also an area of concern for Ocean's **Ian Turnbull**: 'We've yet to see how the restrictions on RAM, compared to the bucketloads you can have on the PC, reflect in the game. We'll certainly have to be cleverer in how we organise the main RAM area.'

Phil Harrison plays down criticism of the PlayStation's lack of RAM: 'A lot of developers from the PC community initially think that 3.5 megabytes isn't enough, but it's not actually a great problem. PCs don't use memory as efficiently as the PlayStation, so I think that it's unfair to look at the PC market for comparison.'

However, RAM aside, there are differences between the PlayStation and the PC that will make the transfer of some titles difficult. While the PlayStation is not a true multitasking machine, it has some degree of multi-threading (the hardware does things by itself in the background). The PC is inherently a single-tasking machine, so taking a complicated PlayStation game that uses CD-streamed backgrounds, video decompression and sprites and converting it to the PC might prove a tricky job.

Ocean

Ocean's Manchester offices house its 65-strong internal development team, Tribe. The company has four projects in the pipeline for the PlayStation, two of which use proprietory 3D engines, with the remaining two based on proprietory 2D engines.

'Like any piece of hardware, it would have been nice if [Sony] had gone that little bit further,' offers Ocean's Ian Turnbull, 'but then they wouldn't have been able to meet the price they were aiming for. ' German newcomer Neon is also under contract with Ocean for PlayStation development.



Ocean is investing heavily in establishing a customised range of in-house *C* libraries and programming standards. Its first PlayStation projects include this animated adventure







Namco has 20 Sony titles in the works under the direction of Shigeru Yokohama (centre). New title, *Ace Combat* (far left)

The use of the programming language *C* is instrumental in developing across both the PC and PlayStation. *C* has allowed Sony to distribute libraries for PlayStation programmers to speed up the development of traditionally time-consuming code. Sony has also adopted the language as a means of safeguarding the future compatibility of its machine should it decide to tweak or optimise the hardware – any game that has been extensively hard-coded could be rejected by Sony. By using library routines to handle all hardware access, all Sony has to do when new hardware comes out is recode those routines to ensure that everything is compatible. (Sony uses the excellent freeware compiler GNU *C*, which, because the PlayStation is based on the widely used MIPS processor, is familiar to hundreds of thousands of programmers around the world.)

Of course, many assembly nuts will throw up their arms in disgust, but coding solely in assembly on a machine like the PlayStation leads to ludicrous development and debugging times. Harrison has the last word: 'I'm not suggesting that our approach will shrink development times dramatically, but I do expect that the technology side of the game will get fixed much earlier in the schedule, and the rest can be spent making great games.'

Bullfrog

Bullfrog has four PlayStation games in the works, including *Theme Park* (using the PlayStation memory cards), a 'blindingly fast' *Magic Carpet*, and an original title, *Syndicate Wars*. Boss Peter Molyneux isn't coy about his admiration for the PlayStation: 'For a console, it's really, really brilliant. Compared to working on the 16bit machines, it like being released from jail in terms of the freedom you have. However, I do hope that Sony don't adopt the traditional console approach where everything has to get approval. That's why there's so little originality on the consoles.'



***Syndicate Wars* (above) uses a new graphic engine and an immersive 3D perspective. According to Peter Molyneux, Bullfrog's conversion of *Magic Carpet* will be 'amazing'**

The development system

The PlayStation may have been conceived and developed almost exclusively in Sony's Tokyo R&D labs, but its software development system has its roots embedded in British soil. Bristol company SN Systems is a six-man company which was given the honourable task of designing a development system for Sony's new games console. Its PC-based development tools are now standard Sony issue and are used by PlayStation developers all over the world.

Co-owners **Andy Beveridge** and **Martin Day** have a rich experience in games design. They used to form an Amiga and ST coding team called The Assembly Line, and before that Andy worked at Realtime Games in Leeds (ironically, Realtime is now a Sega-owned company called Cross Products which also makes development systems), while Martin was programming the eminent 16bit blaster *Xenon 2* for cult coding firm The Bitmap Brothers. The duo came together to form The Assembly Line in 1988 but it wasn't until 1990 that SN Systems was formed. Since then, the company has supplied development system software and hardware for various machines, including the ST, Amiga, Mega Drive and SNES.

Sony entered the scene in late 1993. At that time, SN Systems was publishing its development software through Psygnosis under the PSY-Q name and also supplying the company with all its internal system requirements. When Psygnosis was acquired by Sony, the Liverpool-based company was lucky enough to get early access to the first PS-X hardware shipped into the UK. And it wasn't long before SN Systems took delivery of one of the very first boxes. 'Just before Christmas we were given one of the MW.2 boxes by Psygnosis,' recalls Andy. 'They told us they were developing for this secret new console. We couldn't talk to anyone about it, but they needed our help.'

In Japan, Sony had been preparing to use its own Sony News workstations for PS-X development – these were expensive MIPS R4000-based machines that could be connected to the prototype PS-X box. But the thought of using expensive Japanese workstations was abhorrent to a PC-friendly developer like Psygnosis, so SN Systems were given the chance to create something around the PC.

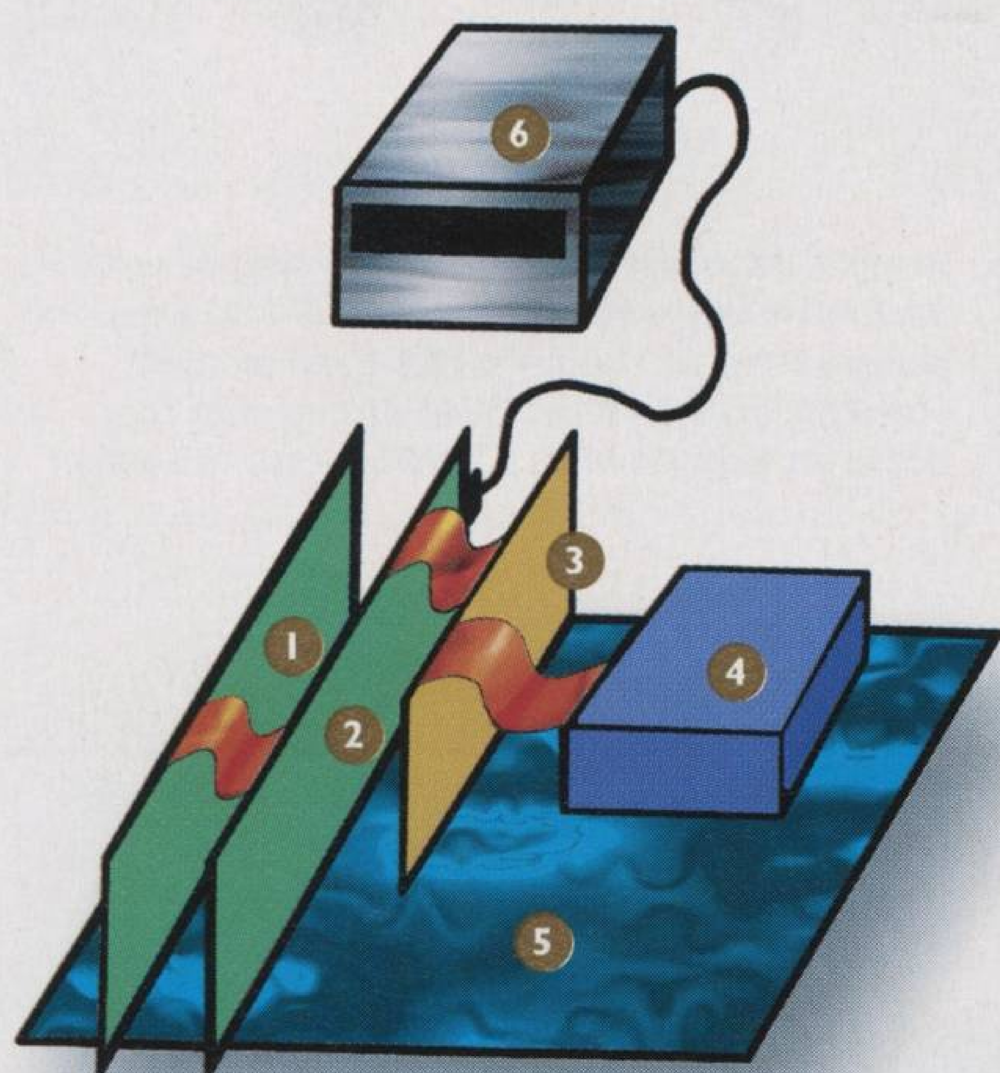
'We worked right through Christmas and New Year,' remembers Andy, 'and then, at the Winter CES in Las Vegas in early '94, Psygnosis arranged an audience for us with the Japanese. Andy and Martin showed off both the GNU *C* compiler and the source-level debugger running on a PC through Sony's MW.2 box.'

Fortunately, Sony liked what it saw. A few weeks later SN Systems received notification that Sony in Japan had decided to abandon its plans for an exclusively workstation-based development system and had opted for SN Systems' PC approach instead. An order for 350 systems immediately followed, and the Bristol-based company supplied Sony with software that included an assembler, a linker (which allows fragments of code to be linked together) and a debugger. Another order for 300 systems followed shortly afterwards.

In late spring 1994, Sony's development hardware progressed to the MW.3 target box, which contained final silicon – although some boxes lacked sound hardware (or libraries to make use of it), and there was still no CD drive in sight. But Sony's next move consolidated its commitment to the PC as a base platform: the PlayStation hardware was condensed by SCE Japan onto two cards that would fit inside a standard PC. The Japanese flew Andy and Martin out to Tokyo in June to let them work on the new setup and write new software, so that the bulk of the existing system worked with the new hardware. Apart from extra RAM (eight megabytes of DRAM as opposed to two megabytes in the production PlayStation) and some PC logic, the hardware that slotted into the PC was virtually the same as the production PlayStation.



Andy Beveridge (left) and Martin Day have taken SN Systems into the fast lane







The PlayStation development system fits inside a PC (above left) and contains (diagram, top left): 1 an ISA card containing the PlayStation CPU, GPU, VRAM and DRAM, RGB, with Composite video out and a 9-pin comms link socket (above right, top card); 2 another ISA card containing the CD I/O, PC interface, kernel boot ROM, and joypad sockets (lower card); 3 a CD emulator card designed by SN Systems; 4 hard drive; 5 PC motherboard; 6 PlayStation-spec CD-ROM drive

Continued next page

PlayStation developers

Continued

The PlayStation development system was now almost complete bar one vital component: the CD-ROM drive. While the twin PC cards had already been shipped out to developers, the CD drive was still in development in Japan. In October, three months later than planned, SN Systems finally received a production-spec CD unit (it was brought over personally by an SCE manager because Namco was waiting on it to complete *Ridge Racer*). This enabled the company to design a CD emulator card which connected to a hard drive and output a steady data stream equivalent to that from the CD drive. Now PlayStation code could be written and tested under simulation without having to repeatedly cut expensive gold CDs (requiring a specialist Sony machine costing £4000).

For testing from CD, a gold disc can be run on the Playstation-spec CD-ROM drive (now included in the full development kit). In theory, if that disc works in the development kit it will work in the production Playstation (it's possible to play *Ridge Racer* through the development system, for example). However, the few differences between the development kit and a production Playstation mean that final testing is done on a blue debugging PlayStation – this is the closest it gets to running on a production console before the complete game is submitted to Sony for duplication. The blue machine (only supplied to NDA-signed developers and the Japanese games press) reads both encrypted (black) and unencrypted CDs.

Now that its tools are in use throughout the entire PlayStation development community, SN Systems has had to become used to fielding a constant stream of queries from developers around the world. Andy claims that they manage to turn most problems around in a few hours, though. 'Having e-mail has been a lifeline in this business,' he declares. With a Saturn development kit now complete, the company is looking to capitalise on its skills and is channelling its efforts into porting its tools to other platforms – including non-games machines.

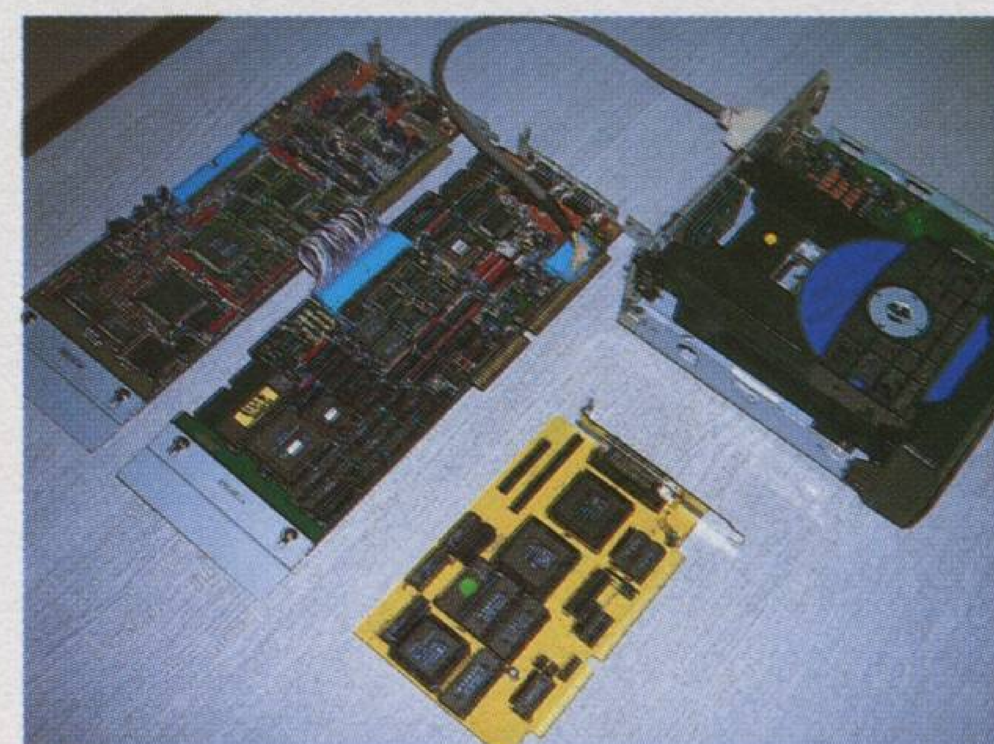
SN Systems can be contacted on 0117 929 9733.





An example of MDEC at its most impressive can be found on SCE's *Runtime Library* CD







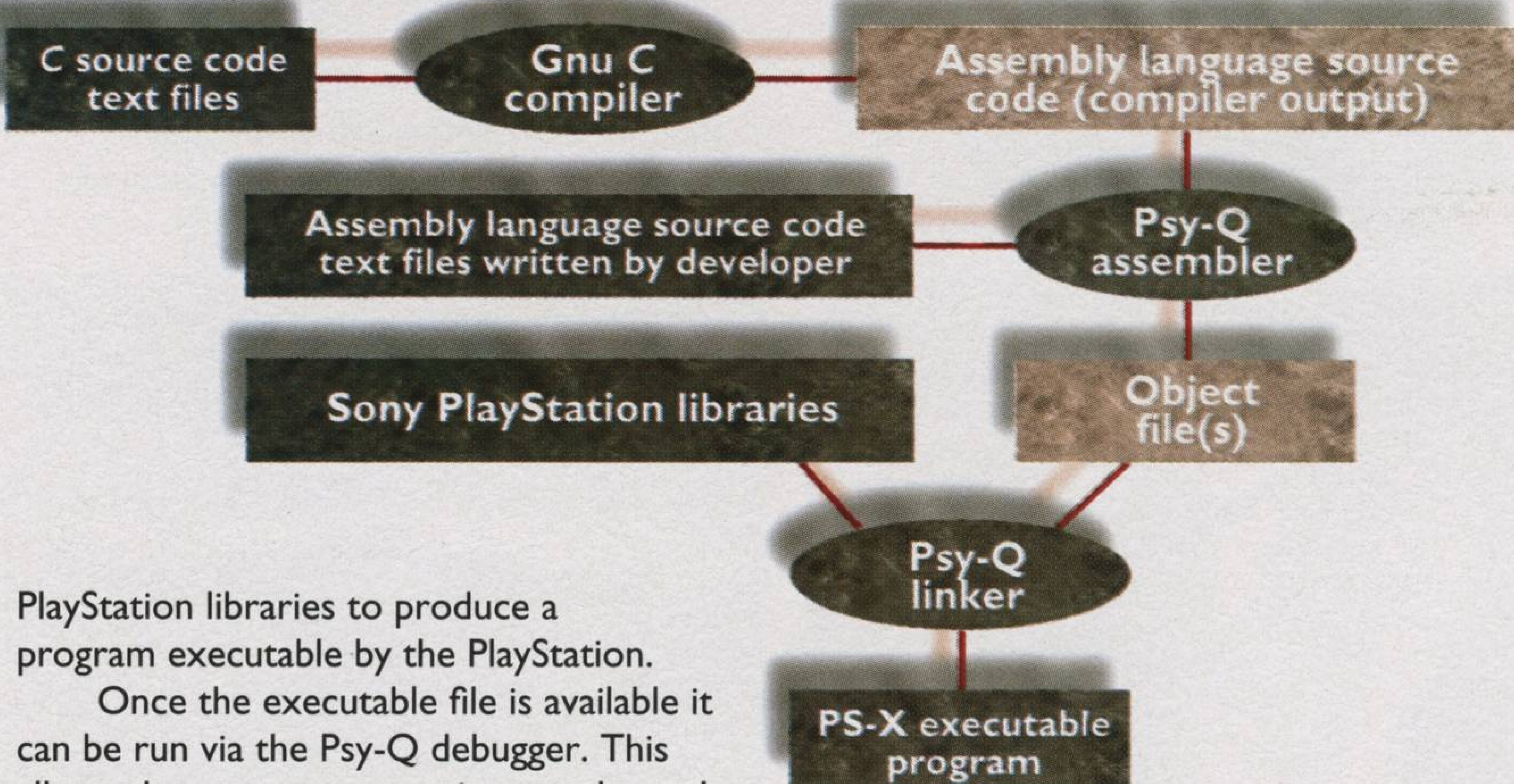
Sony's development hardware began with a series of large target boxes (MW.3, top) and progressed to the twin ISA card system (centre) now in use. Final debugging is done on Sony's blue PlayStations (above)

Psy-Q-logical: PlayStation authoring made easy

The Psy-Q development system produced by SN Systems mimics the operation of a commercially available PlayStation to allow efficient authoring of titles for the platform.

The primary function of Psy-Q is to enable programmers to switch easily between *C* (relatively easy to write and debug) and assembly language (faster and more efficient), and to merge disparate parts of the program into a coherent whole. *C* source code written by the programmer is compiled as assembly source code and then passed onto the Psy-Q assembler. The assembler also receives assembly code written manually by the programmer to eliminate specific bottlenecks in the program and merges the two together. The result is then passed onto the Psy-Q linker, which links the embryonic program with standard PlayStation libraries to produce a program executable by the PlayStation.

Once the executable file is available it can be run via the Psy-Q debugger. This allows the programmer to inspect the code as it runs and gives the option of run/stop/stepping it and inspecting the *C* or assembler at any point. Crashes can be analysed and more efficient code devised.

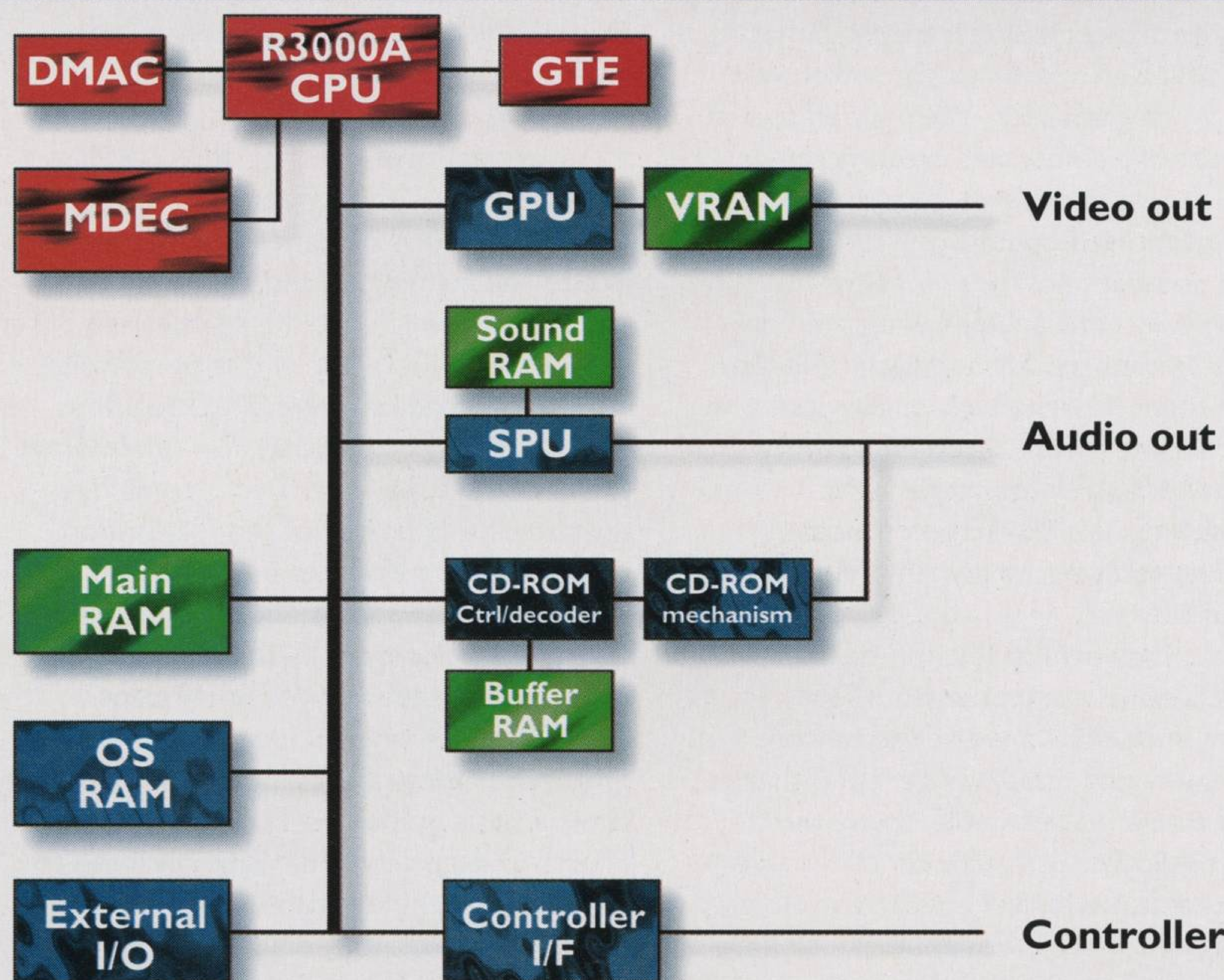


Some of the nuts and bolts of producing a PlayStation program are hidden from the developer by the tools. This diagram shows the main stages in the programming process

Inside the Playstation

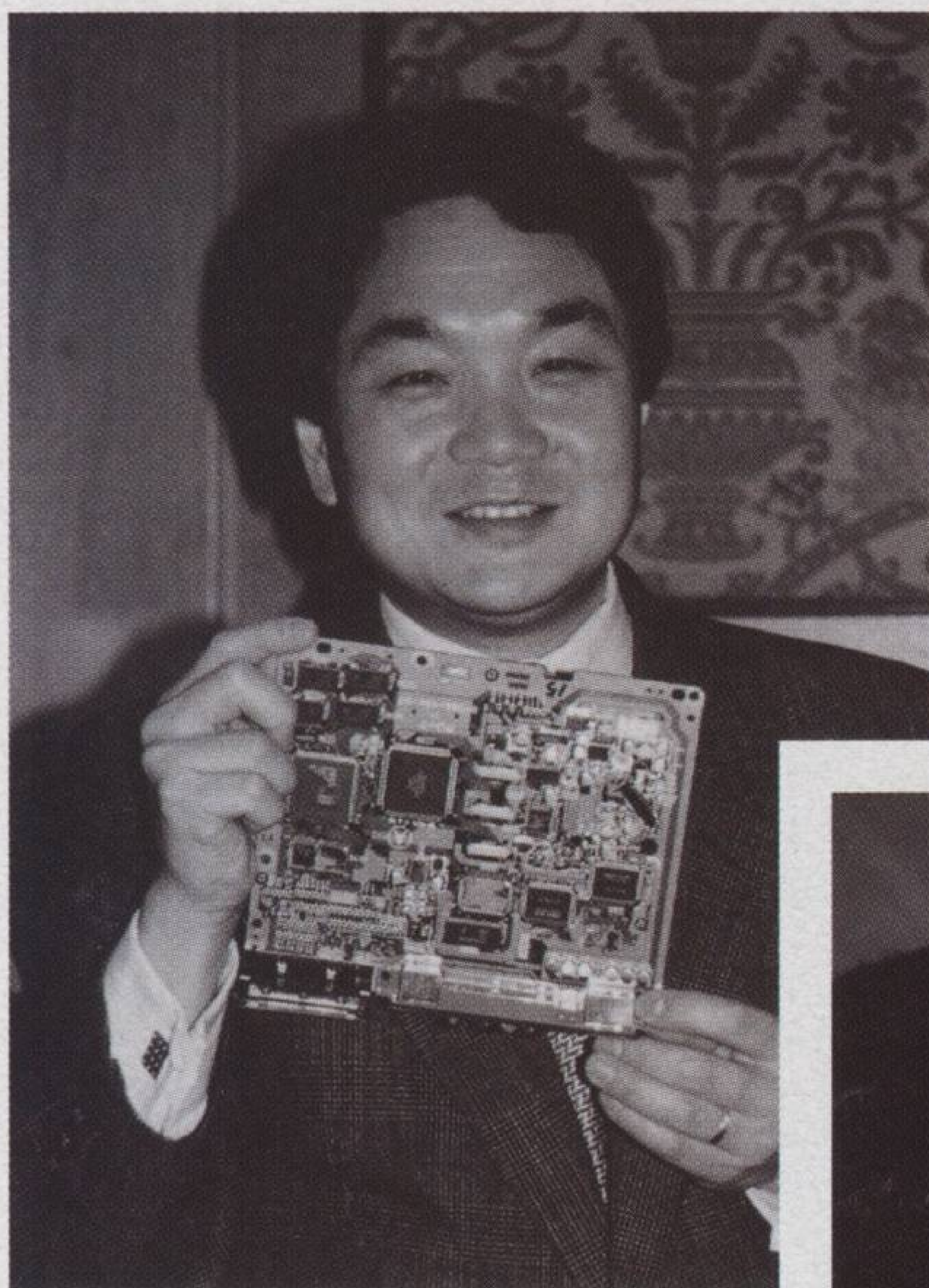
The PlayStation's VLSI (Very Large Scale Integration) architecture can be seen on the diagram (right). The actual circuit board (above) contains the following chips:

1 The CPU (a 33MHz R3000 @ 30 MIPS) also contains the 66MIPS Geometry Transfer Engine (GTE), the DMA controller, and Sony's 80MIPS proprietory MDEC video decompression hardware. MDEC gives fullscreen high-quality video playback, and can also decompress graphics into VRAM
3 The GPU (Graphics Processing Unit) – handles everything that's drawn onscreen
2 Operating system ROM – initiates the boot-up sequence on switching on
4 2Mb DRAM (main RAM)
5 1Mb VRAM (video RAM)
6 16bit sound processing unit delivering 24 channels of ADPCM @ 44.1 KHz
7 512K sound RAM
8 CD controller – contains a CD ROM-XA converter (allowing up to eight simultaneous streams of mixed audio and CD data) and a small amount of buffer RAM
9 Digital signal processor for CD drive
10 16bit video digital audio converter
12 Video decoder and encoder – NTSC or PAL signal decoder that sends signal to TV



PlayStation developers

An interview with Ken Kutaragi





Ken Kutaragi is the hardware mastermind behind the PlayStation. The44-year-old director and general manager of SCE's R&D division in Japan has been with Sony for 20 years. **Edge** chatted to Kutaragi-san at Sony's recent PlayStation Technical Workshop in London.

Edge Which aspect of the PlayStation was it most important to get right?
Ken Kutaragi The objective was a high-performance, low-price videogames system which also had a design which was easy to write games for. We wanted to get many software companies creating games, and so we had to design a very small and very sophisticated operating system and develop software libraries to help programmers. This enabled programmers to create games quickly and easily and also allowed them to write high-quality games in a short period. Those three things were the most difficult things to get right.
Edge Perhaps the PlayStation's most distinctive feature is its joypad. Why was it designed like this?
KK The gameworld is 3D so it needs the deep directional control buttons [the shoulder buttons]. So we added buttons for the index and middle fingers and then realised that it was unstable, so we put a grip on the lower part. We simulated every situation that the joypad could be used in. We imagined what it would be like to have to continually put the pad down when mapping a game, play while lying on the floor and many other cases. After that we had to decide on the weight of the buttons and the pad itself. We adjusted the weights one gramme at a time and eventually found the correct balance. We probably spent as much time on the joypad's development as the body of the machine. Sony's boss showed special interest in achieving the final version so it has his seal of approval.
Edge Do you think programmers will achieve effects with the hardware that you thought were just not possible?
KK We continue to have software engineers write new libraries to exploit the hardware in new and exciting ways. So the answer is yes, and who knows where hardware of such sophistication will go? But we are developing new and innovative libraries which will push the hardware even more than you have seen to date.
Edge Which game have you been most impressed with so far?
KK *Toh Shin Den*. Takara had to get used to a new platform but they still created a game with very good graphics.
Edge What kind of game would you most like to see running on the PlayStation?
KK A game which has the synthesis in 3D graphics of a character with a personality. Where you had onscreen a 3D realtime generated personality that you can interact with in a personal way. That's combining the processing power of the PlayStation with high-end computer graphics to generate realistic faces and personalities.
Edge How closely does the finished PlayStation resemble your early plans?
KK 100%. The original idea was to make a synthesiser for graphics. Something that takes a basic graphic and then adds various effects to it quickly and easily. I wanted to develop a machine capable of displaying subtle effects without difficulty. We achieved that. I have a long list of additional things which could be used in future generations of the hardware, but in order to meet the low cost, many elements had to be left out of the current machine.
Edge What additional features would you like to see in PlayStation 2?
KK Two things. One is higher performance in computer graphics, which benefit from faster and more compact integration of silicon. Within ten years we will see vivid computer graphics on a TV screen which are generated by 0.25-micron silicon. This enables us to have CG rendering power of 10 million polygons a second. That is equivalent to a movie-quality image. But the most important thing is that over the next few years there will be widespread use of high-bandwidth communications, which would be a feature of future versions of PlayStation technology. Though clearly, as a videogames machine, it's important to have even more spectacular effects.
Edge How frantic did everything get towards the end of the project?
KK At the peak we stayed up all night for several nights in a row. We couldn't stop working because our work was so interesting. The only problem was that our office in Akasaka didn't have a bath in it. One of our employees didn't wash for over two weeks!





Ken Kutaragi's team developed a series of amazing realtime demos that authenticated the PlayStation's specifications

Europe: the



state of play

For a long time, European developers have thrived on cheap computers and home-grown talent. But now a declining 16bit computer market is taking its toll. Without investing in new formats and tackling the changing global software market, some European codeshops could find themselves left on the Continental shelf. **Edge** rollcalls the European class of '95

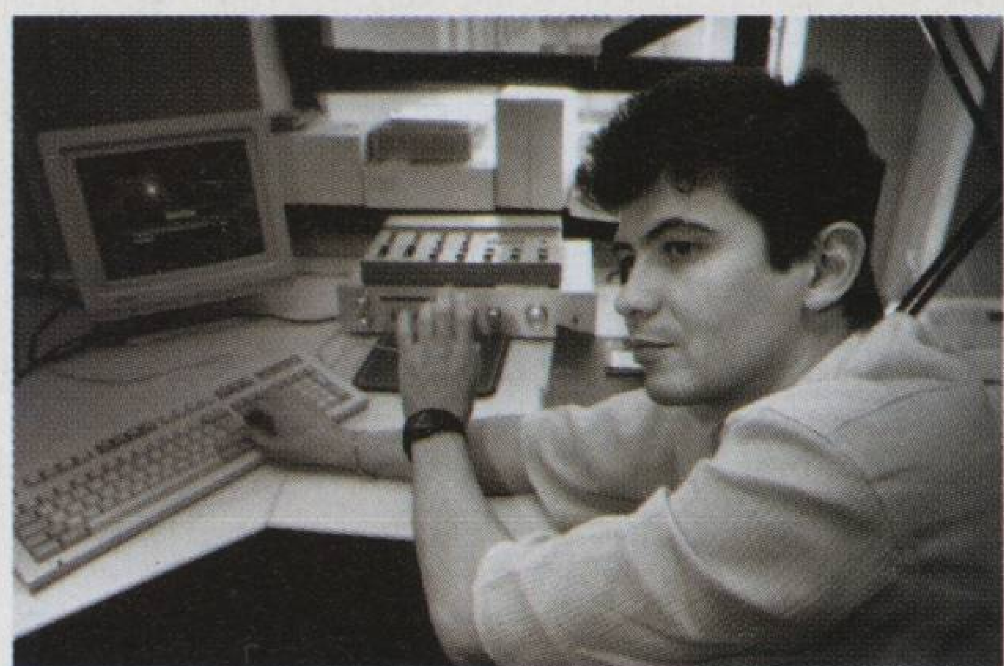
European developers



Although Continental Europe harbours some of the world's best games talent, it has never found it easy to sell its product to the rest of the world. European developers certainly have no shortage of innovative software, but they lack the financial muscle to promote their games outside Europe and have often found themselves shut out by the play-it-safe attitude of US and Japanese marketeers.

In France, for example, developers have been hamstrung by publishers' reluctance to sink money into game development, which has resulted in a plethora of ill-conceived and mediocre titles. Without investment, French developers simply weren't as experienced as their British and American counterparts.

But despite its disadvantages, France has delivered many memorable games. And the industry has matured considerably since its early days. Initially, French developers consisted of a smattering of small teams, most of them located in the Paris region. Recently, the establishment of larger companies like Cryo Interactive, Delphine Software and Coktel Vision has created a more solid foundation. Cryo is especially interesting because it is allied with a film production company (Compagnie des Images), a computer graphics company (Id3D) and Dark Horse Comics France. This spread of interests guarantees Cryo a wide range of artistic resources. The company's biggest project is currently Virgin's ambitious (and expensive at well over £2 million) action CD-ROM adventure, *Scavenger*, which mixes film footage with digitally composited effects.





Adeline Software's Frédéric Raynal (top) and Cryo Interactive's Jean-Martial Le Franc



Frédéric Savoir (left) and Eric Chahi invested three years in Virgin's *Heart Of Darkness*

On a smaller scale, Parisian team Amazing Studio is on the verge of giving the French games industry a shot in the arm. Designer Eric Chahi (author of possibly the most famous French game of all, *Another World*) left Delphine Software after completing his polygon masterpiece and took with him key members of the team (who were working on another acclaimed French game, *Flashback*) to set up Amazing Studio. At the Spring ECTS, Virgin will unveil Amazing's first project, *Heart Of Darkness* (page 42), which has been kept under wraps for the last three years. The game is in broadly the same style as *Another World* but includes some spectacular effects and new graphics techniques.

The constant movement of staff between competing companies has always been a characteristic of the French games industry. The country's biggest developer, Lyon-based Infogrames, lost many of its principal employees when the developers of the seminal *Alone In The Dark* left to form Adeline Software.The game's lead designer, Frederic Raynal, and four other team members were later joined by another exodus of Infogrames staff and now occupy offices just a stone's throw from Infogrames' HQ.

The 14-strong Adeline team made its own debut a few months ago with the very polished CD-ROM title *Little Big Adventure* (renamed *Relentless* in the States because EA's US marketing execs thought *Little Big Adventure* sounded too immature).

'I think we have very good teams here in France,' claims **Victor Perez** of Delphine, Adeline's publisher in France, 'but I do recognise that until now the weakness has been on the playability side. From what I have now seen in-house, I can tell you that this preconception will no longer exist.' Adeline Software is now hard at work developing a sequel to *LBA* for the PC and PlayStation and a full-spec arcade game, *Time Commando*.

Another French company making itself known is Atreid Concept, which can be found in Bordeaux. Atreid houses 45 developers and was recently acquired by the all-consuming Pearson New Media. While the company has yet to hit the big time, there have been some notable projects, including *Pac In Time*, *Fury Of The Furries*, and its latest game, *Warriors*, which boasts some impressive technical feats.

Germany has long been renowned for its technically adept developers but, as in France, a lack of confidence on the part of the international games industry has meant that few German developers have ever made it big.

'Originally, almost all of the guys who are now in development in Germany came from Rainbow Arts,' recalls **Julian Eggebrecht**, head of the Cologne-based Factor 5, one of Germany's most respected development houses. Factor 5 itself originated as one of Rainbow Arts' in-house teams, gaining a reputation for slick C64 and Amiga homages to popular coin-ops, including the arcade-perfect *Gauntlet* clone, *Garrison*, and *Katakis*, a superb shoot 'em up that had to be redesigned because it paid rather too many compliments to Irem's classic *R-Type*. Rainbow Arts also attracted attention when its *Super Mario Bros* 'tribute' *Great Giana Sisters* was withdrawn after a Nintendo official clapped eyes on the game at a trade show.

While Rainbow Arts' own development has been scaled down, Factor 5 has become probably the most successful independent developer working out of Germany. As well as coding games for major thirdparties like Konami and LucasArts, it has recently produced the spectacular *Super Turrican 2* for Ocean and *Indiana Jones* for JVC, and is working on a big PlayStation 3D title due to be unveiled by Sony at the Los Angeles E^3 show in May.

Many of the developers in Germany come under the umbrella of a large holding company called Fun Soft. This huge firm also owns the most successful German software house, Software 2000 – a team based near Hamburg that has managed to corner the burgeoning German market for football management games but has made little impact outside its native land. But there remains one other promising German developer: newcomer Neon. A graduate of the Amiga hacker scene, it was



2 UBI Soft
Paris

Publisher and developer of exceptionally pretty platformer *Rayman* for the Jaguar, Saturn and PlayStation

3 Cryo Interactive
Paris

One of the French industry's driving forces. Its 110 staff have ambitious projects in the works for consoles and PC

4 Silmarils
Paris

Adventure game specialist responsible for titles such as *Robinson's Requiem.* Also has offices in Nancy

5 Coktel Vision
Paris

Member of of the old school of French games development. Recent releases include *Lost In Time* and *Woodruff*

6 Delphine Software
Paris

Set up in the late-'80s by French entrepreneur Paul de Senneville. Best known for *Another World* and *Flashback*

7 Virtual Experience
Paris

New developer dedicated to producing Jaguar games. Software includes *Burn Out* and *Val D'Isère Skiing*

BELGIUM



1 Visual Images
Ghent

One of several European developers with a penchant for the Jaguar. *Hyper Force* is one title known to be in development

FRANCE



8 Infogrames
Lyon

The largest French games firm and also one of the longest established. Famous for its *Alone In The Dark* series on the PC

9 Adeline Software
Lyon

Frederic Raynal's team was founded in January 1993 and is now working on a sequel to the PC's *Little Big Adventure*, which will also appear on the PlayStation

10 Atreid Concept
Bordeaux

A rising star in the French development community. Purchased by Pearson New Media Entertainment for over £2 million



11 Dinamic
Barcelona

The company behind old 8bit and 16bit games such as *Army Moves*, *Navy Moves*, and *After The War*. Still developing small-scale projects

SPAIN

European developers



formed from the remains of Langen-based Kaiko (which programmed the Amiga shoot 'em up *Apidya*) and is now creating some exceptional PlayStation and PC titles for Ocean.

In Scandinavia, the hacker scene has always been a reliable source of programming talent. However, the danger for developers is that just because someone can make the Amiga scroll in multiple directions at lightning speed, it doesn't follow that they can make a great game (anyone remember the beautifully crafted but ultimately dull *Sword Of Sodan* from ace Danish demo coder Soren Grönbech?). 'There are a few teams who made it from hacker status to development teams during the SNES and Mega Drive days,' admits Eggebrecht, 'but the risk has always been an overwhelming factor for most publishers.'

Nevertheless, UK companies such as 21st Century, Team 17 and Renegade have all had strong links with companies based in Scandinavia. Team 17 has worked with developers in Norway, Denmark and Sweden, while 21st Century tied a publishing deal with legendary Swedish hacking team The Silents for its *Pinball Dreams* series on the Amiga, and US firm Scavenger relied on a team of Swedish demo coders for the superb Mega Drive *Thrust* clone, *Subterrania*. Examples of Finnish demo coders made good include Bloodhouse (*Super Stardust*) and Terramarque (*Elfmania*).

'There's an enormous amount of talent up there – perhaps not so much on the game design side, but definitely in terms of coding and artistic design,' asserts Team 17's **Martin Brown**.



With the spirit of Commodore (patron saint of European programmers) now fading, there is some concern about the future of Euro development. 'The freak days of the C64 and Amiga have gone,' reflects Eggebrecht. 'I just don't know if developers will come from the PC as they did from the Amiga.'

> 'The freak days of the C64 and Amiga have gone. I don't know if developers will come from the PC as they did from the Amiga'
> **Julian Eggebrecht**, Factor 5

Adeline's **Frederic Raynal** agrees: 'The loss of the Amiga will mean that the last hacker machine is dead. The PC might become the new home programming platform, but it is still harder to program. In the old days you switched on your computer and *BASIC* was there waiting for you. Now you have to buy a compiler. It's just not as friendly as it used to be.'

Although the Amiga hacker scene is still active on the Continent, the gradual demise of the Amiga software market has led to some smaller developers going under. In Denmark, there are now fewer developers than ever before, and the mainstay of the demo coding scene, Amiga team Kirk Moreno, has decided it can't survive without Commodore. 'The bottom line for us is that we need to see Commodore grow and get healthy again,' says boss **Ken Damgaard** grimly.

In Italy, some developers have disappeared, but newer companies like Graffiti (Virgin's *Iron Assault*), Dynabite (Core's *Little Red Adventure*) and Light Shock are preparing themselves, like gamehouses throughout Europe, for a future based on the PC and the new CD-based consoles. But newcomer Naps Team – a four-man outfit based in Sicily – is still happy to channel its talents into the Amiga. Its first effort, Gremlin's *Shadow Fighter*, has already been acclaimed as the finest Amiga beat 'em up yet.

Clearly, those European developers depending exclusively on the Amiga will be in for a rough ride. And while many coders will undoubtedly be able to switch to the PC, the transition to developing for new CD-based console formats remains prohibitively expensive. As Delphine's **Victor Perez** puts it: 'I'm not sure that all French companies are ready for the next-generation machines. You need very expensive and powerful development stations and tools to exploit this hardware. Money is very important for developers right now...'

18 Software 2000
Hamburg

Part of the Fun Soft group. Developer of a range of successful football management sims exclusively for the German market

19 Digi Tails
Hamburg

20 Escal Software
Osnabrück

21 Ascon
Gütersloh

Another part of the vast Fun Soft group. Draws on the talents of several small independent developers

22 Greenwood Entertainment
Bochum

Yet another Fun Soft company. Works almost exclusively on strategy games

23 Rainbow Arts
Düsseldorf

Has only recently started developing again after laying the foundations of the German games industry with Factor 5 and its *Turrican* series

24 Softgold
Düsseldorf

25 Factor 5
Cologne

Technically astute German developer responsible for many great C64, Amiga and (soon) PlayStation games

26 Ego Software
Aachen

27 Eclipse Software Design
Halle

Small team which created Atari's accomplished blaster *Iron Soldier*. Currently working on a sequel for late '95

GERMANY

28 Kaiko
Langen

29 Neon
Darmstadt

Newcomer to the German scene, formed by ex-members of Kaiko. Working on PC and PlayStation games for Ocean

30 Blue Byte
Mannheim

Creator of acclaimed games such as *Battle Isle, Jimmy Connors Pro Tennis Tour, Settlers* and *History Line*

31 Promotion Software
Reutlingen

32 Light Shock
Milan

33 Graffiti
Milan

15-strong outfit that created Virgin's 3D shoot 'em up *Iron Assault*. Currently working on a slick *Ridge Racer*-style driving game for the PC

34 Dynabite
Genoa

Responsible for Core Design's recent *Little Red Adventure*. Now developing a new adventure with a horror setting

35 Floating Point
Massa

Team of eight concentrating on Amiga and PC development

36 Holodream
Rome

37 Naps
Messina, Sicily

This trio's first project was Amiga beat 'em up *Shadow Fighter* for Gremlin. A CD^{32} version is on its way

38 Black Legend
Zagreb

One of two East European teams working for Kompart (the other is Warsaw's Union Interactive). Games include *Football Glory*

CROATIA

ITALY


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Testscreen



72

The current shortage of decent games is patently obvious this month. However, **Edge** is first to pass judgement on Sega's beautifully realised Saturn shoot 'em up, *Panzer Dragoon*, a game which should be enough to keep the console's new adopters happy until the *Daytona USA* roll-out.

Heretic and the *Killer Instinct* coin-op both get nods of approval, but Cryo's much-delayed *Lost Eden*, although undeniably pretty, sadly runs out of game rather too quickly...





80



78



76

Panzer Dragoon

Format:	Saturn
Publisher:	Sega
Developer:	Team Andromeda
Price:	¥6800 (£45)
Release:	Out now (Japan)

Panzer Dragoon is rumoured to be the most expensive console project Sega has ever undertaken. It's not difficult to see why. Right from the start, when a silky-smooth camera skims over an undulating alien landscape before coming to rest on the *Panzer Dragoon* logo hewn out of the rock, it exudes the kind of production values only achieved with big-bucks expenditure.

Like Sega's stylish platformer, *Clockwork Knight*, *Panzer Dragoon* boasts a dazzling SGI-rendered intro. This is indicative of the time and effort spent on the project since it was conceived some 18 months ago. Its eyebrow-raising quality is not due to any particular technical feats – it's still as grainy as *Clockwork Knight*'s intro – but to the way it perfectly sets the scene and cues up the action to follow.

Indeed, the cinematic qualities of the intro sequence flow through into the game itself. Its forced play structure (the player's route through the landscape is pre-ordained) has allowed Team Andromeda to go to town in building anticipation and immersion, deliberately delivering action scenes exactly when and where they can have most effect.

But don't let *Panzer Dragoon*'s 'on-rails' nature put you off. You maintain control of the dragon itself (within a play area larger than the

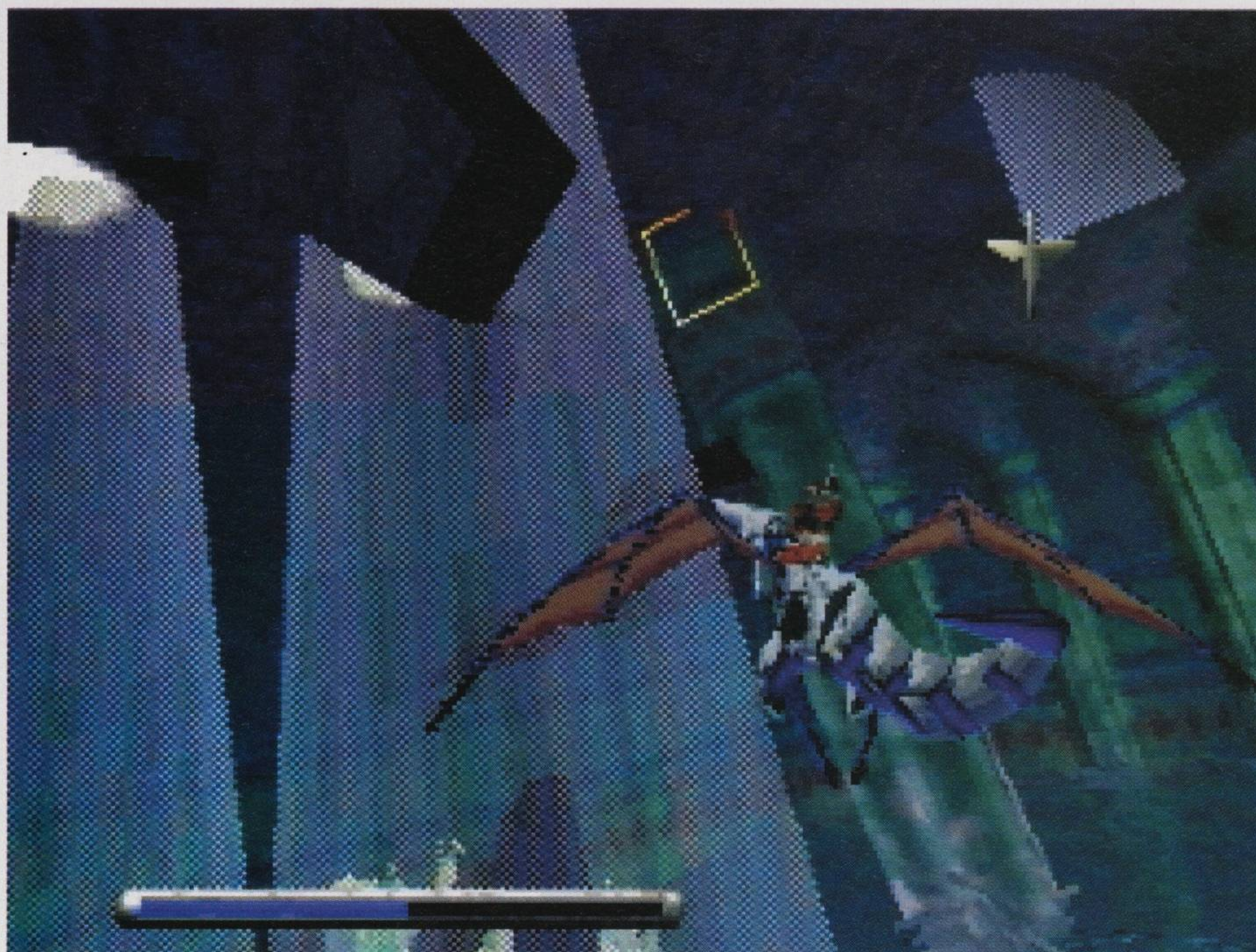


A slice of the intro, showing the dragon swooping over the edge of a cliff. The video quality is the only aspect that lets it down





The first level takes place over an ocean peppered with buildings and ancient stone outcrops. Note how objects are accurately reflected on the water's surface

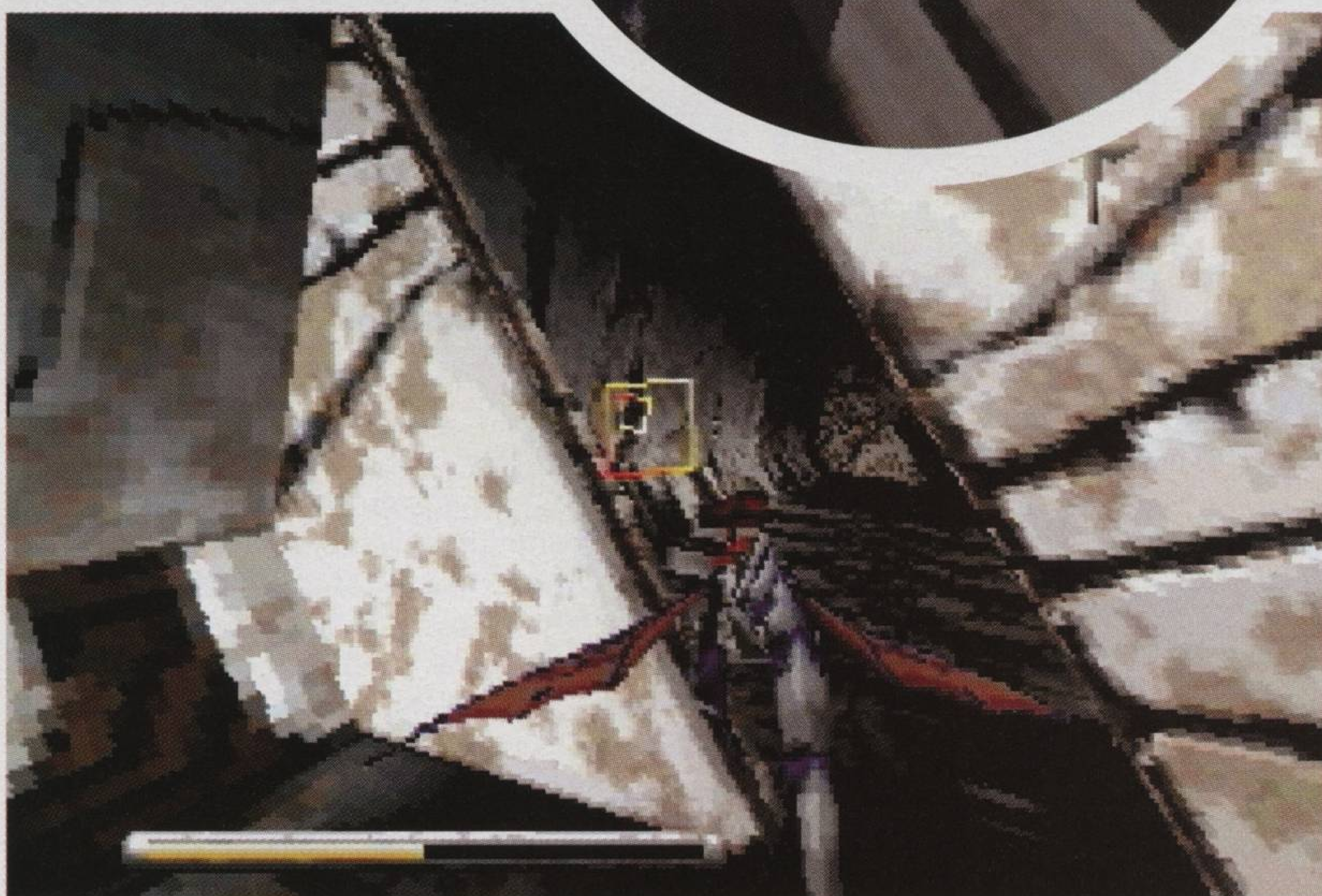


***Panzer Dragoon*'s cinematic inspiration is demonstrated towards the end of the first level. When you reach a temple and there's apparently no way forward, the ceiling dramatically caves in**



Level three is set inside a convoluted tunnel network which opens out into darkened chambers





The tunnels are strangely similar in style to the Star Wars trench scene. Negotiation of moving stone doorways is occasionally required

actual screen) and get to dodge projectiles and slink around obstacles in the more enclosed sections later in the game. And unlike the bulk of, say, *Starfox*, the game route changes direction frequently, twisting and turning to provide numerous changes of pace. It differs from the likes of *Starblade*, too: the fact that all the graphics are generated in realtime means that your encounters with enemies have an increased range of possibilities and ensures that the game avoids the cramped feel of Namco's space shooter.

As fashion dictates, the music is pulled from CD. And a fairly strong accompaniment it is, too, with the first level's funky soundtrack amusingly evocative of the theme from Shaft, although the soundtrack drifts back into more forgettable territory as the game progresses.



As well as the lengthy intro sequence, there are various intermission sections. This one follows the pursuit leading into level three

Spot effects, on the other hand, remain punchy throughout, with throaty explosions and scorching laser effects – the staple fare of many a Japanese anime series – perfectly complementing the action. And it's all delivered in pulsating 16bit stereo.

As well as delivering luscious visuals and sumptuous sound, *Panzer Dragoon* succeeds as a satisfying shoot 'em up. It could best be described as the forebear to *Space Harrier*, taking all the elements of Sega's classy but limited into-the-screen blaster and exploring new directions in just about every respect.

Something it has firmly retained is a simplistic method of attack. There are no multiple weapons or power-up options to cycle through here – simply slap the fire button to unleash a bolt of blue energy, one blast of



Keeping a watch fore and aft is important in enclosed areas as enemies attack from all sides

Continued next page







The forest area is one of the most visually impressive parts of the game. The landscape is composed of flat scaling bitmaps but the foliage jutting out is made from polygons



This pair of ships from level five not only bear a remarkable resemblance to the ones in anime adventure film Laputa but are also almost exact copies of the boss that appears in level one

which is enough to take out most of the game's more belligerent nasties. There's also a lock-on option which allows several enemies to be attacked simultaneously. Swipe your sights over a group of adversaries while holding down the fire button and a confirmation indicator appears over the successfully locked enemies, followed by a stream of powerful homing laser. At first this approach seems to make the game too easy, but, as in *R-Type* (pioneer of the chargeable shot concept), unless you use it in tandem with normal, faster fire you'll come unstuck.

Fortunately, unlike *Clockwork Knight*, *Panzer Dragoon* doesn't lay all its cards on the table in the first session. In 'Easy' mode you can only play the first four of the game's seven levels, and it will take some concerted application in 'Normal' mode before the end sequence is sighted.

It's easy to dismiss the shoot 'em up at a time when a general 'onward and upward' feeling prevails throughout the games industry. But *Panzer Dragoon* proves that with a studied, thoughtful approach, old-fashioned (some might say outdated) game styles can still hold their own today.

Panzer Dragoon isn't a hugely complex enterprise in gameplay terms, but it does demonstrate the cream of Japanese videogame design and flair. And, more importantly, it's a thoroughly entertaining blast.

Edge rating: **Eight** out of **ten**





A sandstorm blows up towards the end of level two, where a fellow dragon is waiting to take on your adopted beast. Use of the lock-on weapon facility is vital to ensure a quick kill



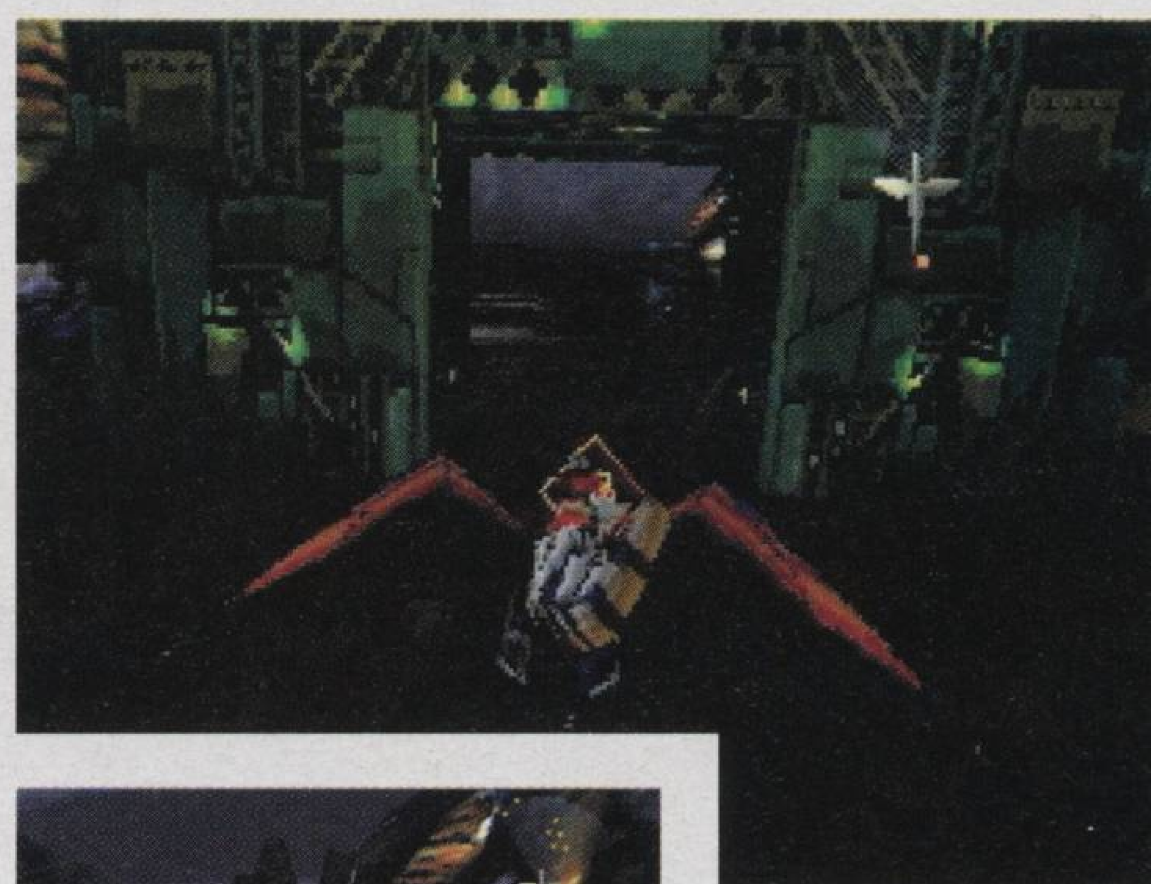
Level four













Before you get to the level three boss you pass through this area (right column), which features all manner of alien mechanical installations and incredible lighting effects. The boss attacks in three main phases (above, top to bottom): at first, it's little threat; with propellers attached, it's more dangerous; finally, it jumps around using its powerful legs

Lost Eden

Format:	PC CD-ROM
Publisher:	Virgin Interactive
Developer:	Cryo
Price:	£35
Release:	Out now (UK)





Aeons ago, humans and dinosaurs co-existed peacefully, but, for reasons that never become totally apparent, Morkus Rex and his tyrants ruthlessly shattered the coalition. The fate of Eden lies in the construction of mighty citadels (right) and the contents of an oversized chicken egg

Cryo's primordial epic exhibits the same faults as other games which have embraced the ethos of the 'interactive movie'. To avoid producing dozens of CDs full of rendered footage, the plot is fairly linear; and to prevent the player enduring the same set pieces over and over again, the gameplay isn't terribly difficult. Sadly, the result is that you can play *Lost Eden* from beginning to anti-climactic ending in around seven hours – less if you know what you're doing.

Admittedly, the journey is an engaging one, full of glorious dino-scenes and with a plot rich in character, legend and mystery. Indeed, the game's strength turns out to be its weakness: because it's so playable and the sights and sounds are so captivating, you simply have no option but to play it to its conclusion.

The structure of the game demands that you visit various locations around the world of Eden, signified by dots on a map. You travel from place to palace to plateau either by plodding brontosaur caravan or, later on, with the help of a flock of pterodactyls.





Triceratops (middle) and pterodactyls (above) become your unlikely companions in *Lost Eden* but, unfortunately, only play supporting roles

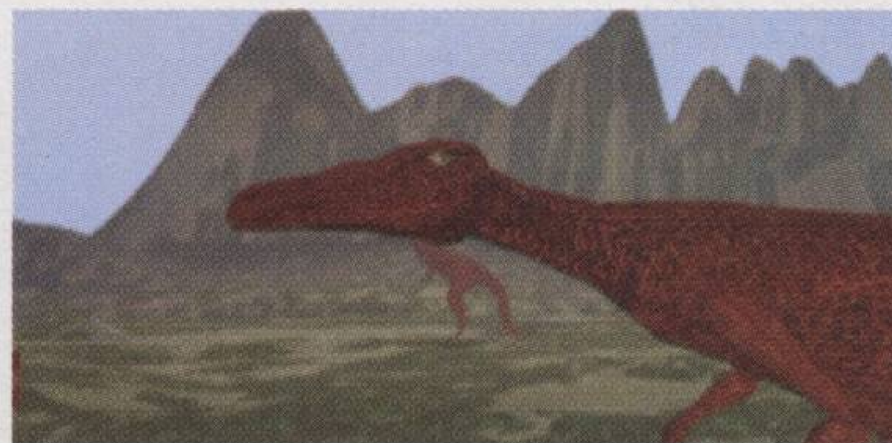
Arrival at your chosen destination brings up a local grid map which divides the area into squares. Each square can be entered either by moving into it from an adjacent one or by accessing an aerial view of the entire location and clicking into it.

As you move through the deserts, forests and mountains in each area, you meet the indigenous peoples of that region as well as friendly herbivores and belligerent carnivores. Your initial task is to convince the herbivores of your good intentions so they can help the

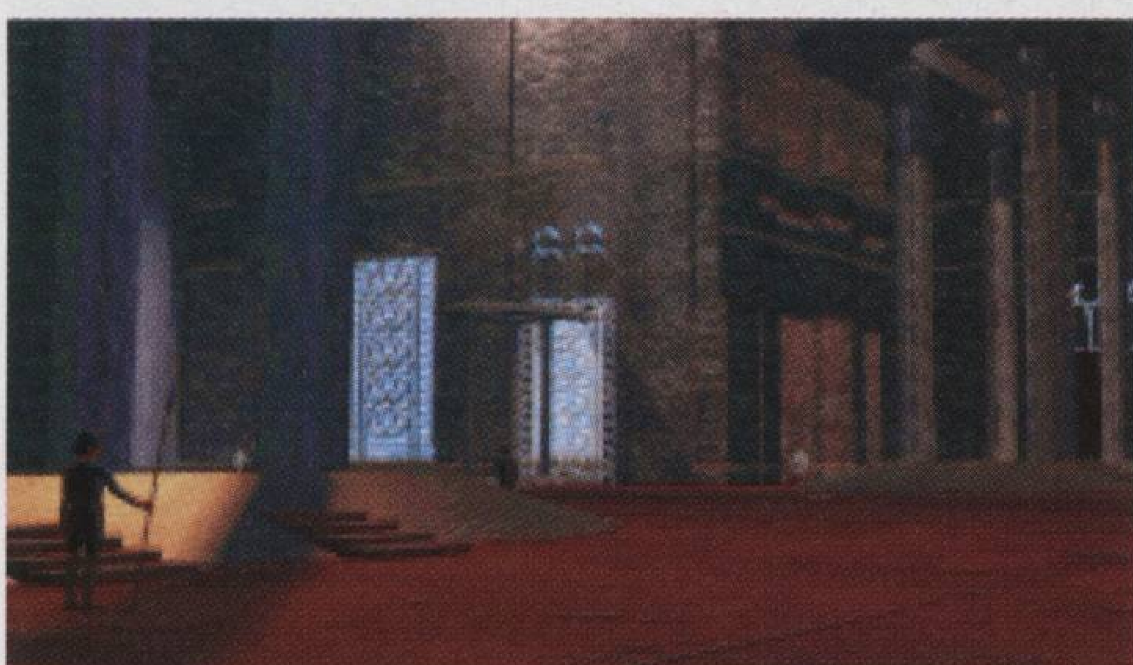


During his quest, Adam (middle) picks up a diverse band of followers, each of whom has advice to offer – although their pearls of wisdom are often accompanied by endless wittering

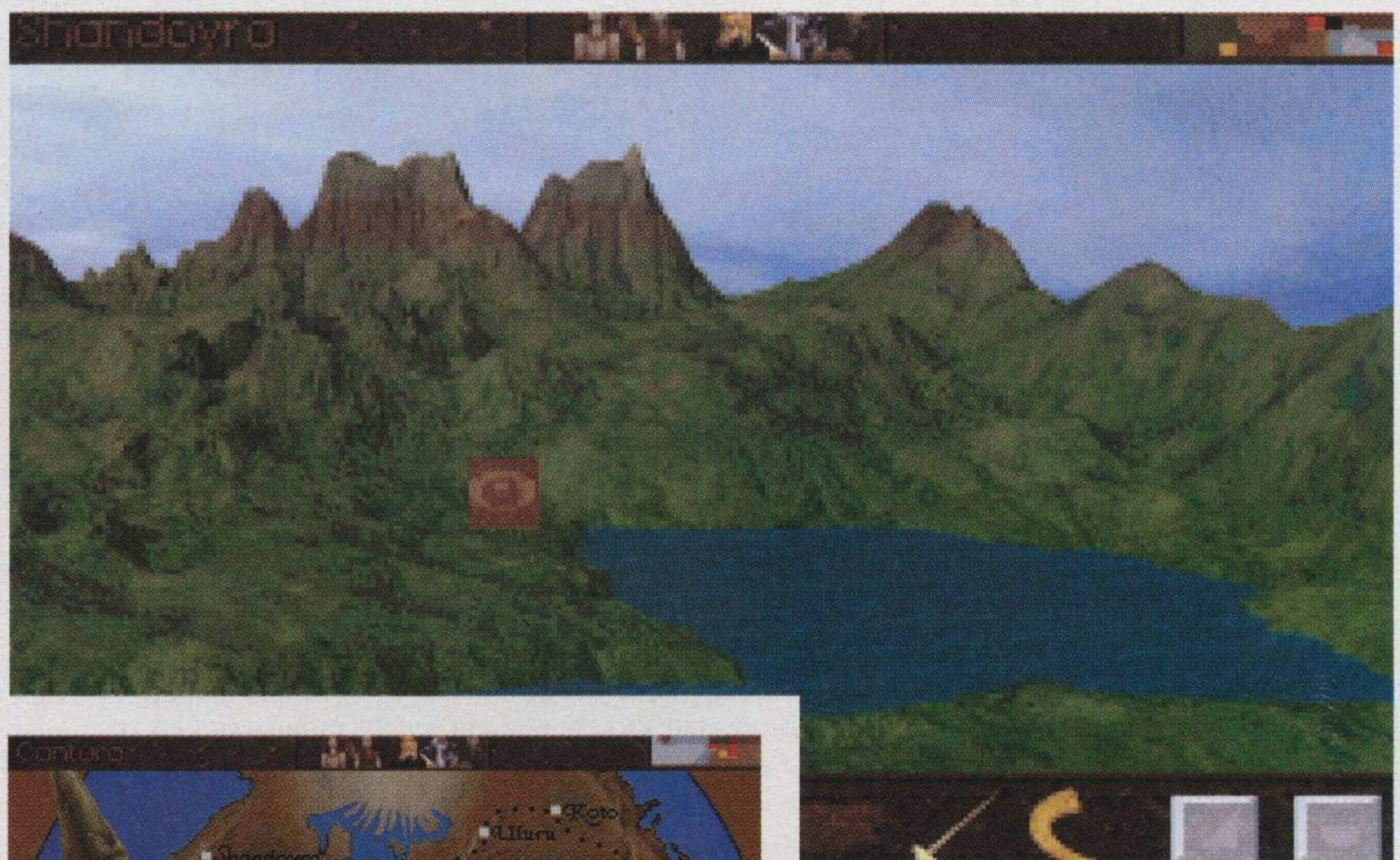




The ultimate aim of *Lost Eden* is to meet and defeat Morkus Rex (left), king of the tyrant lizards. Among your allies are the velociraptors (above), who, although carnivorous and therefore dangerous, can be turned against Morkus' armies



Adam's campaign against Morkus Rex begins within the cavernous halls of his father's palace





The world map of Eden (above) gives you access to a number of regions, such as this valley (top)

humans build a citadel. You achieve this by blowing a tune on a flute which, although it sounds quite dreadful to reviewers' ears, obviously has the desired effect on the giant plant-eaters. Spurred into activity, they begin work on the citadel, but then you're informed that to build a more permanent fortress you need to recruit the nomadic triceratops which meander across the region. And they refuse to join in until the local raptors are corralled against the marauding tyrannosaurs…

And so it continues for the bulk of the game: meeting characters, fulfilling the minor tasks they set you in order to gain the items you need, and coercing the larger inhabitants of Eden to do your bidding, until fortresses are constructed in all six major regions.

Once man and herbivore are protected against Morkus Rex and his forces, the game enters its second phase, with extensive to-ing, fro-ing and plot unravelling until the final conflict with Morkus himself.

Lost Eden plays in a similar fashion to *Millennium 2.2*, and the structure can be compared to *The Secret Of Monkey Island*, although the puzzles are less taxing and the gameplay less hands-on. The rendered scenes vary from adequate to stupendous, but it's amazing how swiftly the novelty of seeing the gorgeous dinosaur segments wears off. And the long sections of dialogue are often a pain: you dare not click past them for fear of missing a vital clue, yet Cryo's scriptwriters obviously prefer to use 100 words when ten would do.

Lost Eden is a bold attempt to bridge the gap between games and movies. But one can't help wondering if all those hours spent watching *3D Studio* render might have been better used constructing a more involving game environment. And for £35 you could buy three feature-length videos… **E**



To succeed in *Lost Eden*, your character, Adam, has to 'die' and pass over to the spirit world. In his non-corporeal state he meets this magical dinosaur, who allows him passage back to Eden

Edge rating: **Five** out of **ten**

Travelling

Traversing the world of Eden is accomplished by means of a simple map system. Eloi – Adam's trusty pterodactyl companion – acts as your guide and, later, your transport.

You undertake a journey by merely clicking on the required port of call. A sequence then follows which shows your entourage being conveyed to their destination (although this part can be bypassed).

On your arrival, a landscape scene reveals the entire region (such as the valley above). The position of the cursor is linked to another cursor on a small grid map, so you can enter the region at any point. This is handy later on for visiting specific locations, such as citadels.

Heretic

Format:	PC CD-ROM
Publisher:	Id Software
Developer:	Raven
Price:	£35
Release:	Out now



Heretic has all the playability of *Doom*, in a different guise. New weapons and artefacts abound (above)





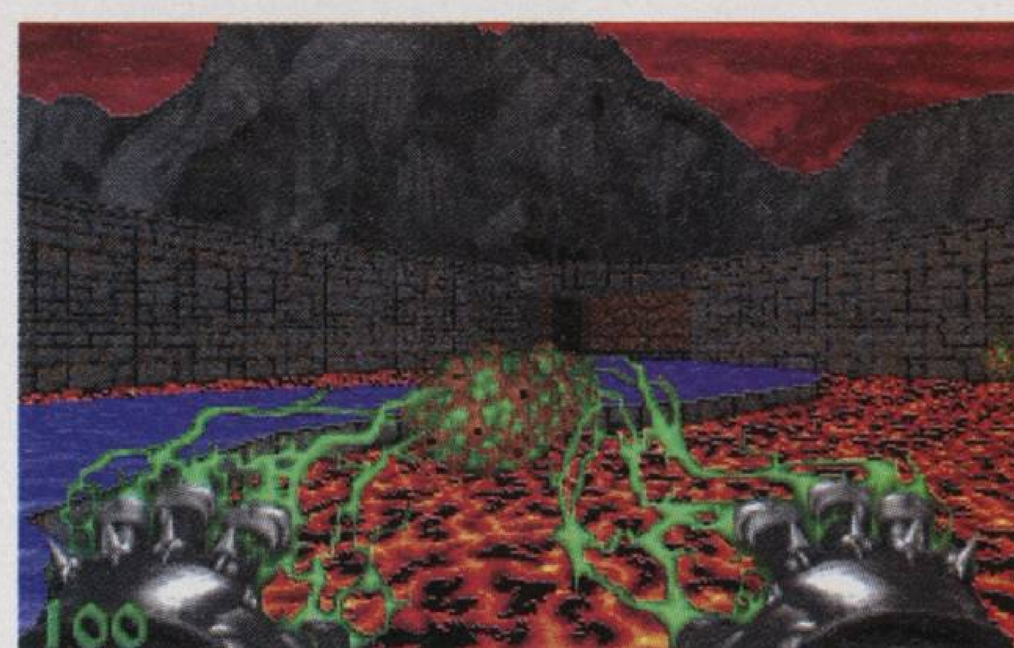


Take out these translucent skulls with the 'Phoenix Rod' (top). There are plenty of different enemies and explosions (middle and bottom)

Heretic is essentially a version of *Doom* for gamers who prefer their grisly medieval violence leavened with swords 'n' sorcery imagery and general spells 'n' potions-type derring-do. It's been available as shareware since last year but is only now being released in its full form.

Raven Software's association with id has paid dividends in terms of both level design and gameplay. Although *Heretic* is basically the same game as *Doom*, it offers enough extra aspects to avoid accusations of being a rip-off. Nine different items can now be collected during your travels and stored for later use. The ability to look up has been added to the engine, although (as with *Dark Forces*) this does little to enhance the gameplay. And there's also a set of wings to pick up which give you the ability to fly around the level – a feature previously only properly exploited in *Shadowcaster*.

Although *Heretic* champions the cause of gory deaths and extravagant weapons initiated by *Doom*, there's never quite the same sense of satisfaction when a baddie goes to meet its maker. Still, there are plenty of exploding bodies in its 30 taxing levels, which are just as action packed and foe-filled as anything *Doom* has to offer and have secrets galore.





Heretic's scenery is impressive (top). The equivalent of *Doom*'s plasma gun (above)

In fact, were it not for its similarity to *Doom*, *Heretic* would be regarded as a landmark game. It's fast enough to compete with the best of 'em and possesses plenty of the raw excitement that *Doom* itself unleashed upon the gaming world.

Edge rating: **Eight** out of **ten**

Killer Instinct

Format:	Arcade
Manufacturer:	WMS
Developer:	Rare
Price:	50p-£1
Release:	Out now









Because the graphics were rendered using Alias' SGI *PowerAnimator* software, adding effects like these (above and left) was a breeze



These zoom-out effects, as seen recently in *Toh Shin Den*, are mightily impressive but don't affect the gameplay to any great degree

The beat 'em up is finally crawling from under the shadow of *Street Fighter II*, struggling to its feet and demanding something different. The appeal of endless sequels, 'special editions' and predictably visceral pyrotechnics has become stale. It's just not enough any more to casually tip a few extra buckets of offal into the back of the machine. A bit of lateral thinking is required.

Killer Instinct is a game fully aware of its responsibilities to its genre. It shamelessly swipes the best bits from practically every other slap 'em down in existence, introduces plenty of its own innovations, and never shirks on the draw-'em-in immediacy and hardcore, advanced playability. Beneath the stunningly detailed character graphics, painstakingly cinematic cut-aways and opulent rendered backdrops sits a game of impressive depth and longevity.

The bones (bizarre hybrid creatures and hostile quasi-humans chipping away at each other's lifeforces) are familiar. But the flesh is distinctive and frequently downright ingenious. Best of all, the absurdly complex 22-hit combination attacks are enhanced with the novel concept of the 'combo breaker' – a move which the unfortunate victim of a combination onslaught can use to instantly 'break' from the carnage. As the combo breakers are relatively easy to master, this makes for fewer of those tedious, over-scientific one-sided novice/expert bouts.

Killer Instinct's audience will no doubt consist of just as many people eager to witness the performance of Nintendo's latest incarnation of Ultra 64 hardware as pure beat 'em up fans seeking a *Mortal Kombat II*/*Street Fighter II* substitute. However, in technical terms the game only intermittently kicks into new territory. Its pre-rendered character intro sequences are supported by











The **fighters**

Killer Instinct features a total of ten selectable characters. Among these are Jago, the game's answer to Ken and Ryu, with Dragon Punch and Fireball moves that owe a great deal to *Street Fighter II*; and Sabrewulf, whose name may well ring a bell with Rare/Ultimate aficionados...

The backdrops are beautifully constructed from solid 3D objects (above and top). When your opponent's energy bar is near empty, it's time to perform finishing moves (above right and top right)



Glacius faces up to Sabrewulf in his home territory. The backdrops in *Killer Instinct* are superb but some of the more spartan levels hardly show off the system's capabilities

ingame images which are not – as has been suggested elsewhere – rendered on the fly from key frames but, in fact, pre-rendered and stored in ROM.

When players break away from each other, the point sampled backgrounds and characters scale out gloriously smoothly – and the selection of square, pseudo-3D backdrops rotate to provide a vaguely *Virtua Fighter* feel, but the fighters themselves remain stubbornly 2D.



Judged purely as a beat 'em up, *Killer Instinct*'s credentials are imposing. It's the authentic element of demanding, difficult-to-master chaos coupled with all-round state-of the-artistry which sends it soaring above its suddenly very dated and apologetic peers. *Killer Instinct* has exhilaration, playability, gore, technical excellence, innovation, good looks and remarkable depth. The format may well remain the same, but now we have a new benchmark for future contenders. Very slick indeed.



Edge rating: **Eight** out of **ten**



Make a mark a

Since its inception in 1992, the Develop! conference has grown in stature to become the premier European event for multimedia producers and entertainment software developers.

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TIMETABLE

SUNDAY MARCH 26

10.00-12.00
Session 1

UNDERSTAND THE PROCESS

Entertainment software development demands a whole range of skills, ranging from music composition to graphic design. Most developers understand something of the procedures involved in the various areas of media production, but many still experience practical difficulties when tackling them for the first time. In this nuts-and-bolts session, covering issues from payment levels and terms to file formats, the experts give you the tips you need to avoid disaster.

Key frames
John Lakewood, Future Reality
Music composition and production
Dave Da Costa, Interactive Music Services
Local Talent
Dave Malone, Graphic Colour Works
Don't Shoot the Video Producer!
Jim Reid, Independent
Aesthetic Interaction
Mike Williams, Neville Brody Studios

13.00-15.00
Session 2

THE MECHANICS OF MONEY

Film, music and theatre have long-established models for dealing with production finance, risk management, tax management and the sale of assets. At present, many publishers and developers operate comparatively unsophisticated financial models, but there are many systems for reducing the cost of cash, for raising additional production or corporate finance, or even for qualifying for subsidies from government organisations. This session is a unique opportunity to investigate the options available.

Understanding Money
Will Keen, Independent
Floating your business
Geoffrey Chamberlain and Peter Tabizel, Durlacher & Co
Applying for subsidies
Garth Shephard, tecKnowledge
Managing Bank Debt
Barclays Bank (speaker to be announced)
Venture Capital
John Scaife, Charon Capital Corporation

15.30-17.30
Session 3

CREATION AND INSPIRATION

The games industry has thrived on a combination of good ideas and ground-breaking technology. Escalating budgets and higher consumer expectations have placed more importance on the pre-production design phase. But the chaos of creativity does not always sit well with the disciplines of technology. In this session, four leading creative talents debate their art and its implications for interactive entertainment. Finally, the session will examine the essential issue of intellectual property protection.

The Conflict Between Plot and Interaction
Chris Crawford, Chris Crawford Games
The Essence of an Idea
Steve Cooke, Myelin
Music for Interaction
Nik and Mrs Fiend, Alien Sex Fiend
Create a living character
Dave Gibbons, Independent
Protect your property
Richard Taylor, The Simkins Partnership

MONDAY MARCH 27

10.00-12.00
Session 4

THE MARCH OF TECHNOLOGY

Entertainment industries have always acknowledged the power of high production values, whether you're designing Starlight Express, shooting Jurassic Park, or rendering high-resolution graphics for Myst. For the most part, however, other industries are working with well-established technologies; in the computer business, the goal-posts are shifting every day. This session illuminates the potentials and pitfalls of five specific technologies that could have important implications for your future production strategies.

Moving Images
Terry Bradshaw, Sigma Designs
Sound Tactics
David Fleck, Creative Labs
The Power of the Processor
Martin Brennan, Flare
In an unreal world
Foo Katan, BITS
Interactive Broadcasting
Matthew Tims, Two Way TV

13.00-15.00
Session 5

IT'S NOT THAT DIFFICULT!

The interactive entertainment industry continues to grow at an explosive rate. For those with the ideas, the commitment, and the desire there is a real opportunity to create successful properties in this exciting market. But it's never easy to enter a new market, even if you have parallel experience in another industry (film, for example, or design).

This session will give you everything you need to know in order to twist the nuts and bolts of the games industry, with help and advice from speakers with years of experience. The format of the session will be designed to maximise the opportunities for personal contact and interaction with the panellists, each of whom brings years of experience in their particular role.

Each speaker will outline their responsibilities, the processes they are a part of, and the industry partners they do business with. Introduced by popular demand, this essential session is designed especially for people outside the interactive entertainment industry, but who may have ideas, projects, or properties that they believe could be realised within it.

My Life As A Publisher
Tom Watson, Warner Interactive Entertainment
My Life As A Developer
Kevin Bulmer, DCD
My Life As A Producer
Neil Jackson, Argonaut
My Life As A Distributor
Robert Stallibrass, Active Distribution
My Life As A Marketing Director
Dean Barrett, Bastion
How to Publish It Yourself!
Andrew Waterhouse, PDQ

15.30-17.30
Session 6

BREAKING THE CRYSTAL BALL

This is a unique chance to meet and share the vision of leading executives from different industries as they disclose their personal agenda for the future of entertainment. This session is essential for anyone in the business of developing business strategies in this market, and will give you the opportunity not only to hear the plans of some of the most important companies, but also to question their representatives in a no-holds-barred environment. Additional speakers for this session will be announced separately.

Nick Alexander, CEO, Pearson New Entertainment
Michelle DeLorenzo, President, Viacom New Media
Keith Ferrell, Vice-President and Editor, Omni Magazine
David Pullen, Head of Interactive Entertainment, BMG UK
Mike Thorne, Director, New Music Media Development, Warner Music International

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They say that the good die young. But that's not the case with videogames. The best games – games like *Exile* – live forever

Exile



You start out defenceless, but you soon find a pistol with which to take out this annoying bird

When Audiogenic quietly slipped *Exile* into the flourishing Amiga market in 1991, it was an instant success. For once, this was a game that actually justified the description on the box: *Exile* really *was* an 'arcade adventure'.

The game actually originated on the C64 in 1989. Although its roots could be traced back to co-programmer Jeremy Smith's previous game, the C64 budget hit *Thrust*, *Exile* was a genuinely groundbreaking product. The Amiga conversion had marginally better visuals but the innovative gameplay was left intact.

The plot was simple. Starting out on the surface of an alien planet, your task was to locate and retrieve fellow space travellers who had been kidnapped and imprisoned in the planet's cavernous depths, using your jet-pack to travel around.

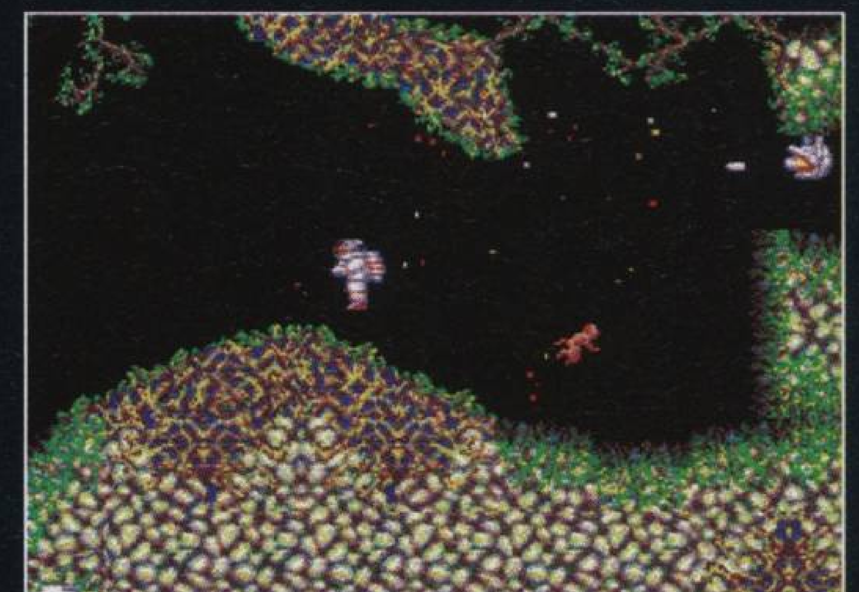
But it was the believability of *Exile*'s gameworld that made it stand out. The surface environment featured winds that could easily blow the unsuspecting explorer off course, and every object had its own inertia. This gave the gameplay a significant realistic edge.

Most importantly, beneath all the simulated physics lay a well-rounded game with layers of intertwined puzzles. One moment you'd be struggling to fathom out a use for your newly discovered remote control device, while the next you'd be agonising over how to tackle a seemingly impassible portal, or puzzling over a particularly cryptic description of an object.

Exile was utterly absorbing, beautifully crafted and arguably unbettered in its field. And a new version with better graphics is on its way to the CD[32].

Formats:	C64, Amiga (version shown)
Publisher:	Audiogenic
Developers:	Jeremy Smith and Peter Irving
Released:	1989 (C64) 1991 (Amiga)

Edge invites contributions to Retroview. Entries must be in Edge style and approximately 250 words long. Published contributions will win their sender a year's subscription to the magazine. Address: Retroview, Edge, 30 Monmouth Street, Bath BA1 2BW. Fax: 01225 338236. E-mail: edge@futurenet.co.uk.





The mission begins in your ship's cockpit (left). An alien lifeform causes bewilderment (top). The robot (above) can be controlled – but only with the correct kit



These water-dwelling fellows can be picked up or even blown away if you're feeling especially nasty



The game's huge play area is divided by portals into sections. This stone slab can be easily kicked out of the way to gain passage

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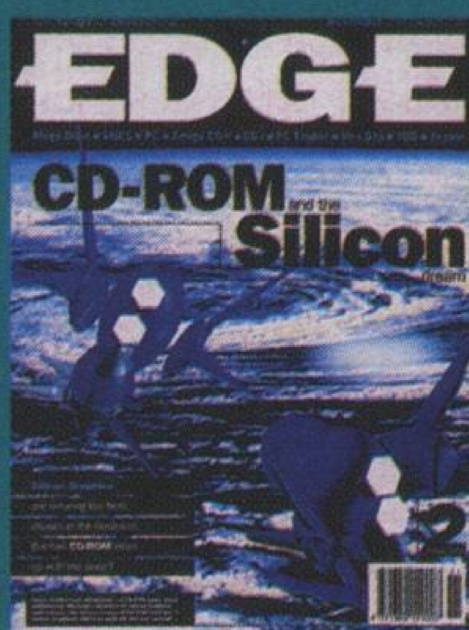


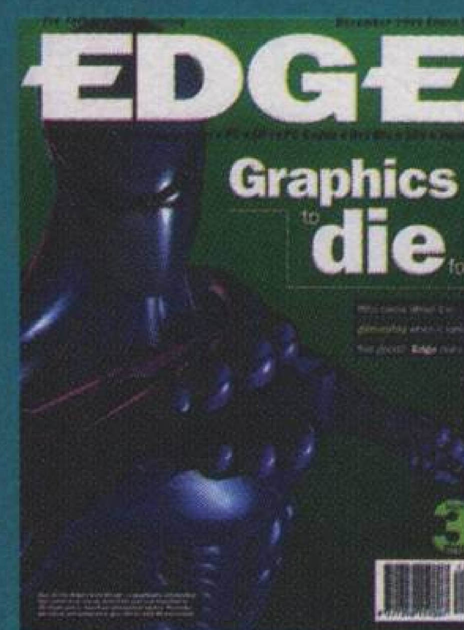


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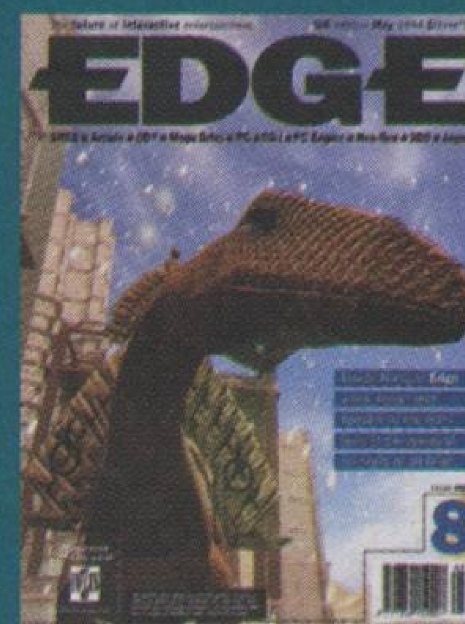
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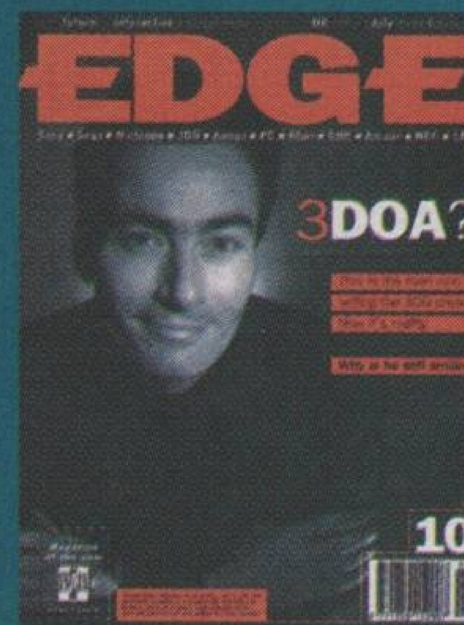


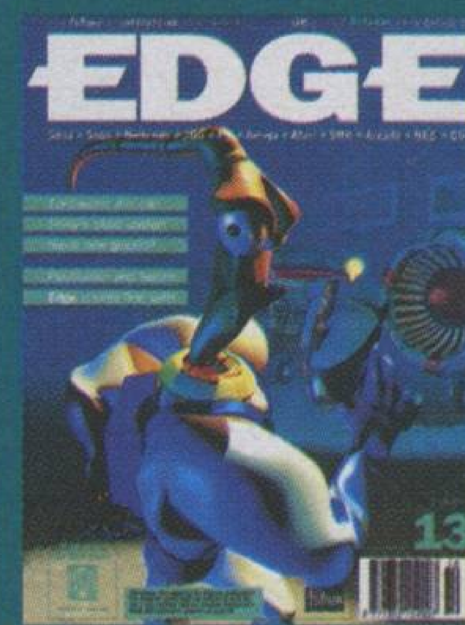


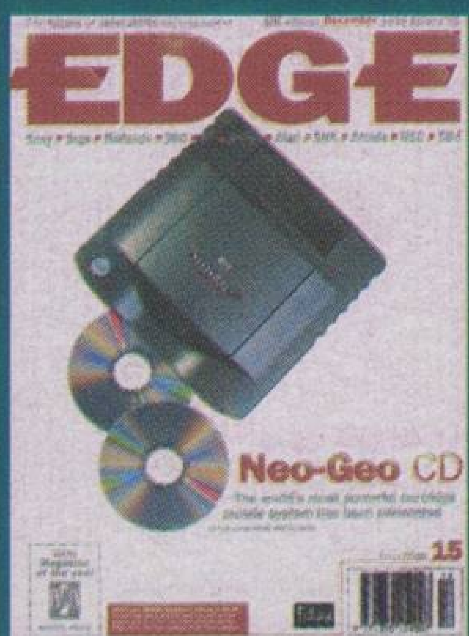




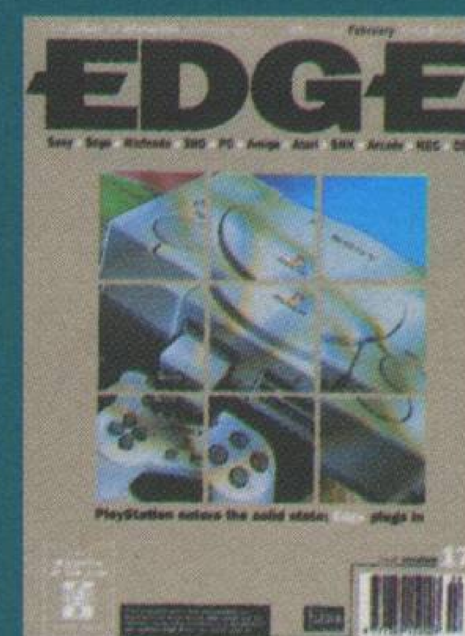


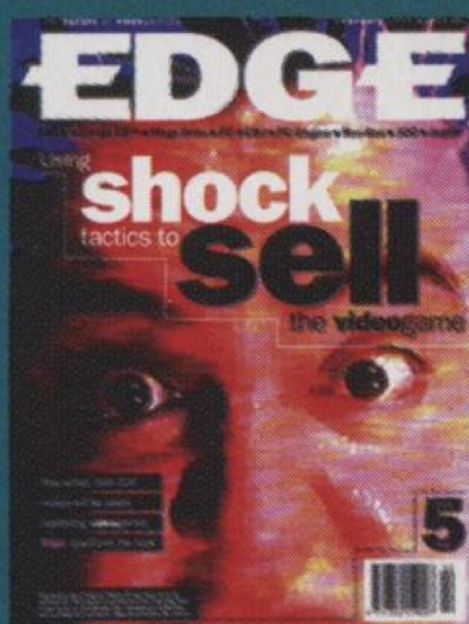


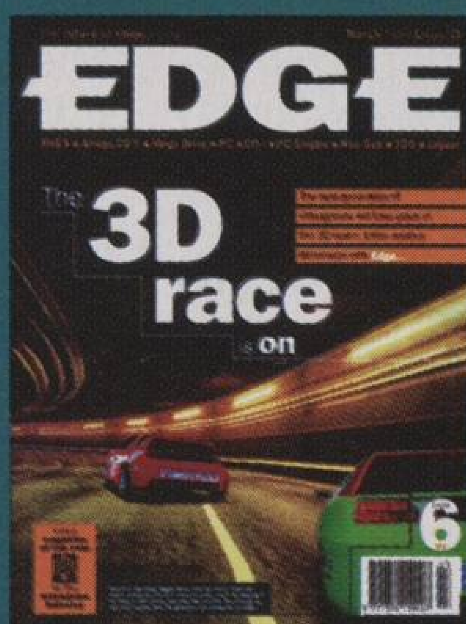


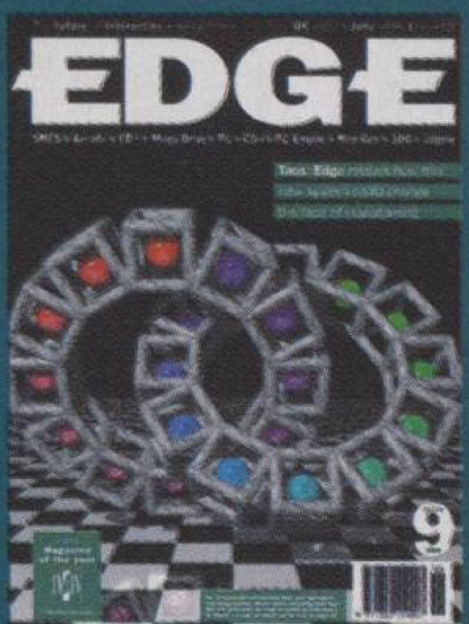


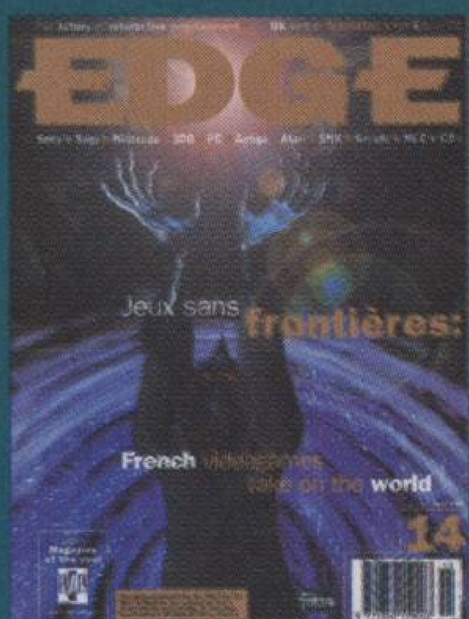


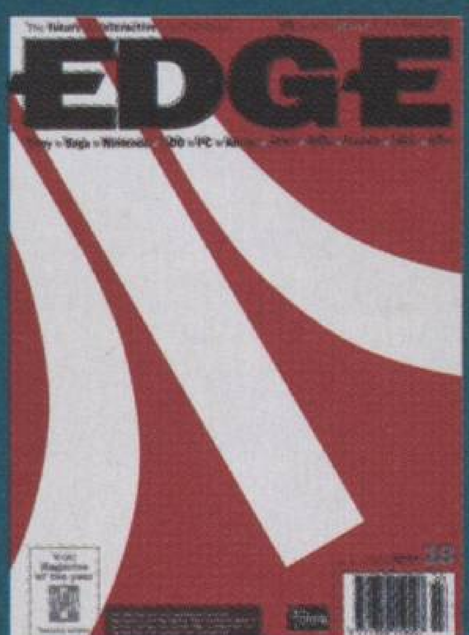




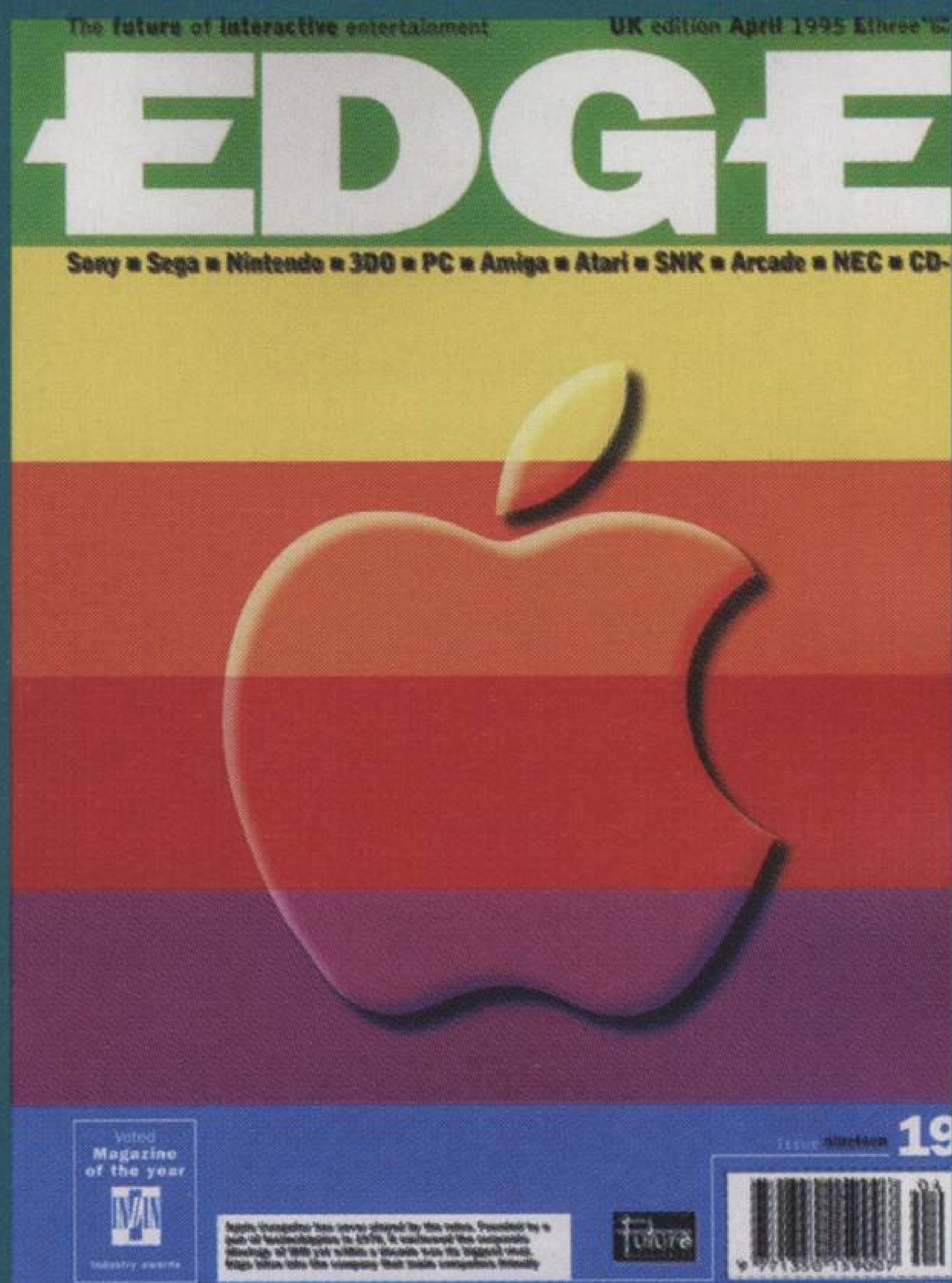


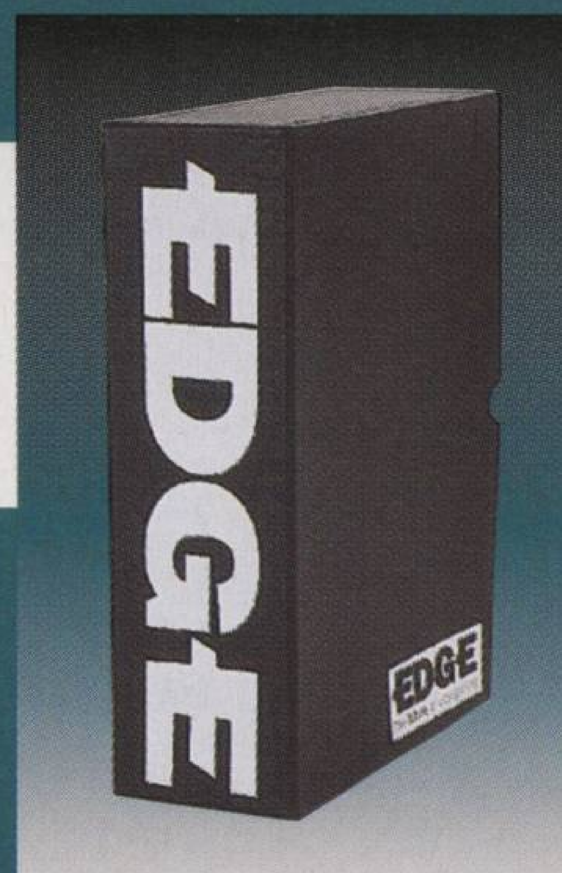






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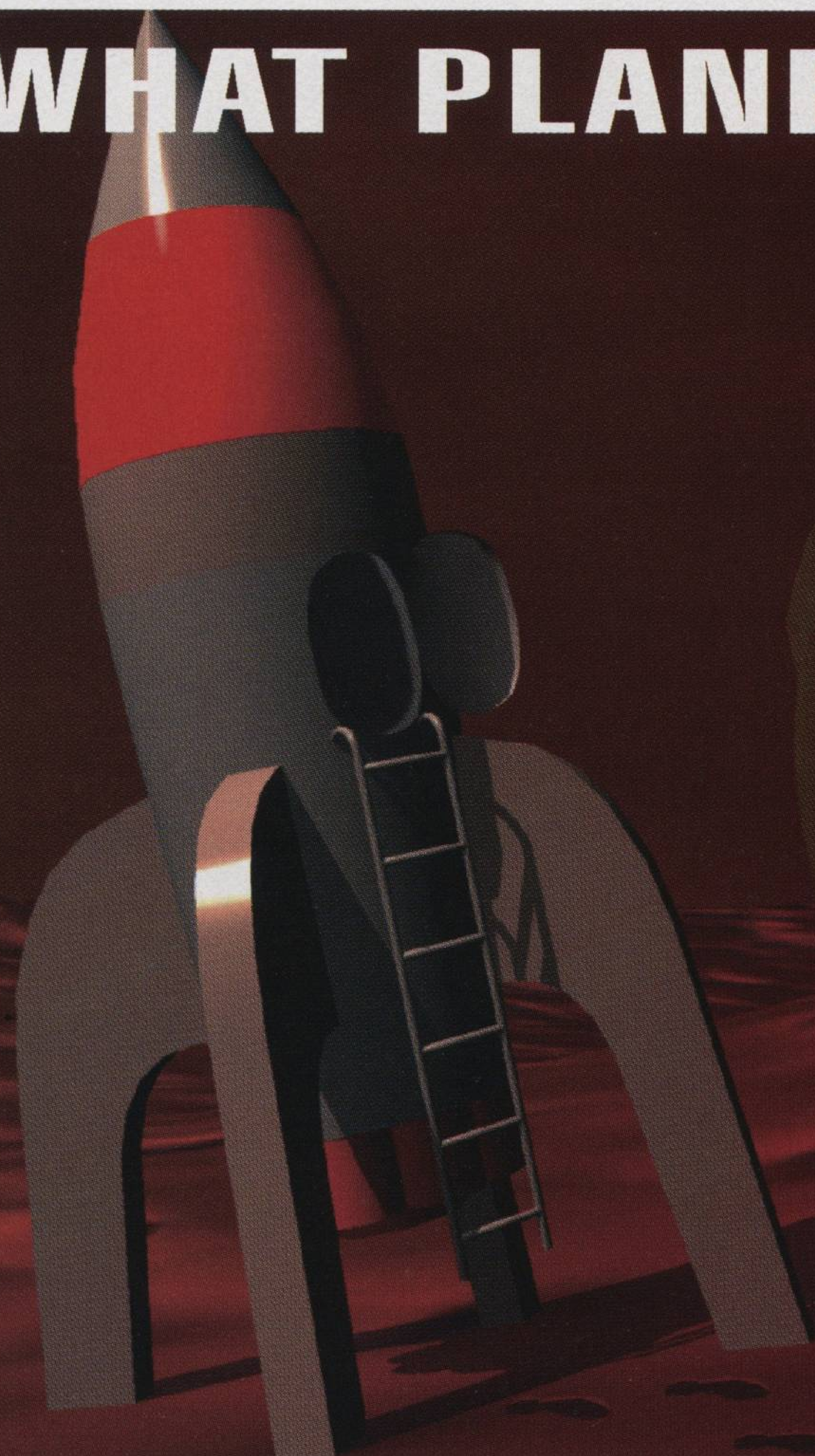
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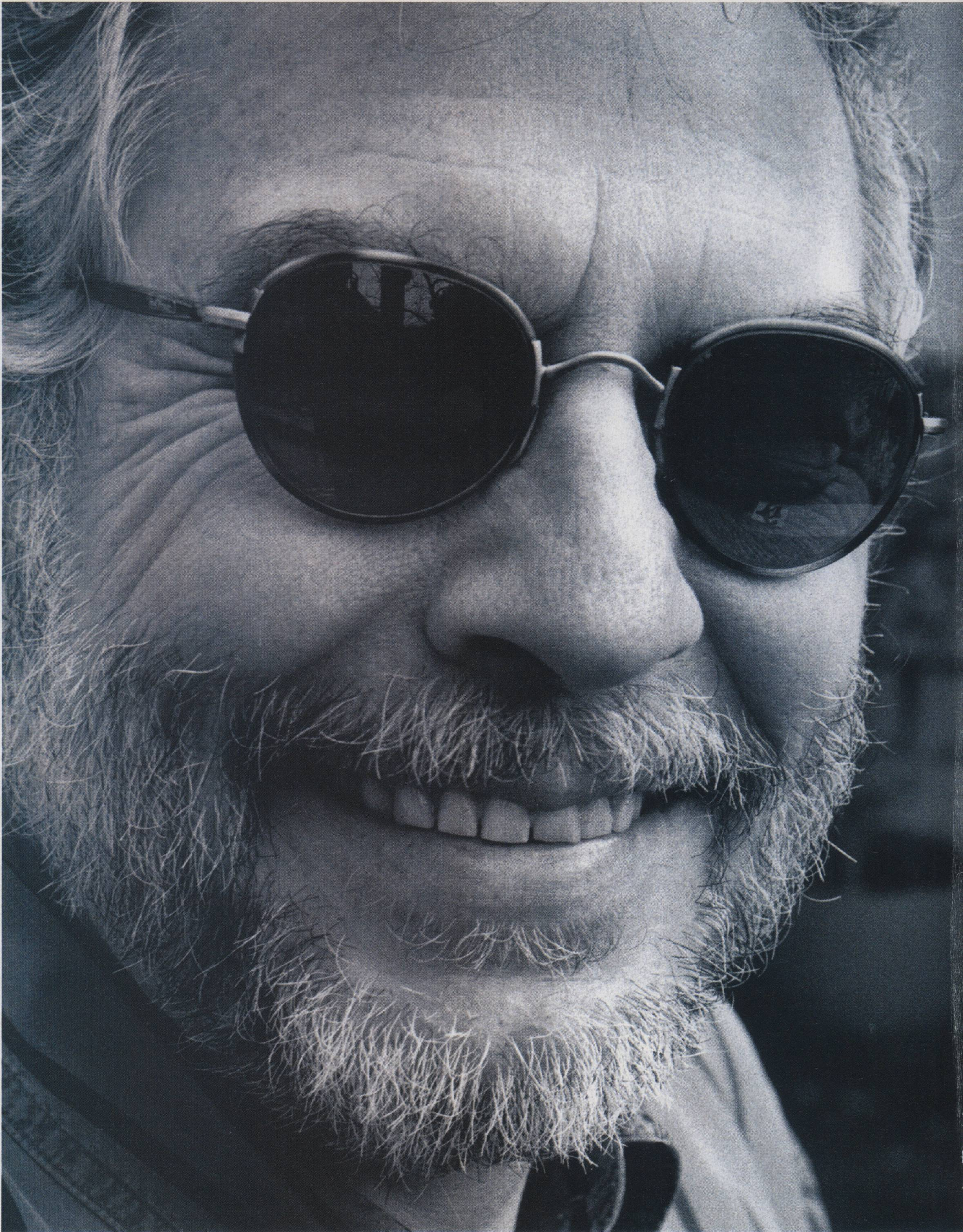
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Photographs: **Jude Edginton**

An audience with...

Nolan Bushnell

Nolan Bushnell, founder of Atari and creator of *Pong*, is part of videogames history. But what does the unwitting grandfather of a multibillion-dollar industry make of his descendants? Edge finds out

Even if – strictly speaking – Nolan Bushnell didn't invent videogames, he certainly let the genie out of the bottle. And he seems to have been blessed with three wishes, too. First, in 1972, he founded Atari with just $250. Then, four years later, he sold it to Warner Communications for a cool $28 million. Second, videogames formed the basis for Bushnell's next creation, Chuck E Cheese – an empire that in 1981 incorporated 278 restaurants and made Bushnell personally worth $100 million. And now his third wish could be about to come true.

Edge met Silicon Valley's most celebrated entrepreneur to glean his unique perspective on the state of gaming in 1995.

Edge How do you feel about being described as 'the man who invented videogames'?

Nolan Well, I've always felt that this wasn't necessarily true. Maybe as I get older I get more modest, but we stood on so many other people's shoulders. What I did was popularise it. I was the guy who saw this stuff in the computer labs and said, 'Gee, you know, normal people would like this kind of stuff too.' So I'm the metaphorical poet who interprets the gods to the masses – in this case technology. And so I kind of see myself as being that middleman who interprets, as opposed to the grand inventor.

Edge Do you think that you've done the world a service?

Nolan Yes and no. Like anything that has an extreme impact on society, there are benefits and problems. There are certain aspects of videogames which are problematic, particularly when played to excess – anything done to excess can become a problem.

Edge Have potential health problems always been a part of the gaming experience – even since *Pong*? Or do you think that the problems have only come about as the games have become more realistic?

Nolan I think that even with the very first games there were problems of overuse and a disproportionate allocation of resources.

Edge You mean people spent money they couldn't afford…

Nolan Right. There were a few *Pong* bums I'm sure who became addicts. I think that people have always enjoyed simulations, and as simulations become more graphic and more real, the fantasy becomes more intense. There's a growing body of work that shows that violence on TV or in games has virtually no effect on the average person, but with certain mental types it can be a trigger point.

Continued next page

interview

And so you have to ask if you want to censor something for the mainstream (on which it has no effect) to keep it away from a minority of the people on whom it does encourage behaviour problem. These are questions for politicians, not scientists.

Edge Do you still play games?

Nolan Yes, a lot.

Edge What do you play?

Nolan I find that I like games which have a new look, a new feel, a different world. And I particularly look out for games which have a certain mathematical balance to them – *Tetris* is one that I found to be topologically and mathematically very satisfying. Extremely so, in fact. But at the other end of the scale, I most recently found *Myst* to be highly satisfying.

Edge *Myst* was seen by many gamers as a non-event. It looks good, but there's little gameplay. So what do you like about it?

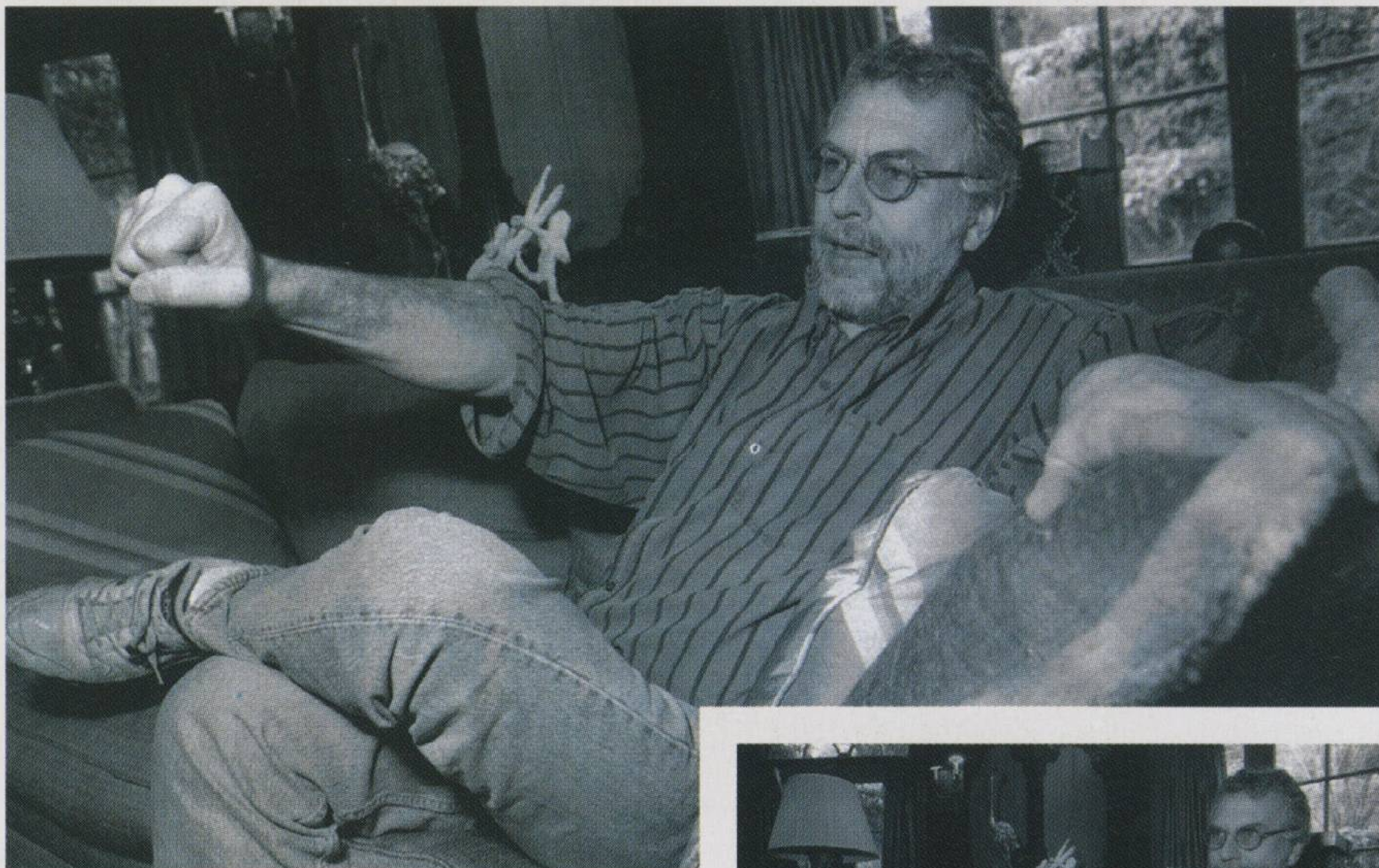
Nolan Well, the immersive characteristic of the world made it. The puzzles were intriguing and well integrated into the narrative – even though there wasn't much in terms of narrative. The world was compelling and believable. And the puzzles were believable in their mix into the world. And the art and sound was excellent.

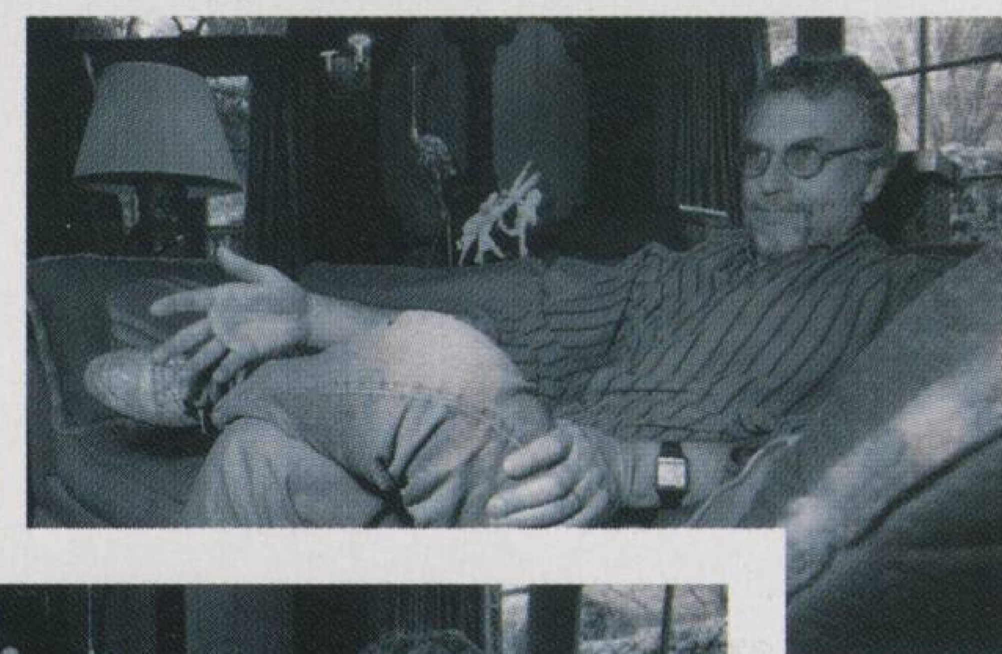
Edge Are you surprised that the games industry has become so big? Or are you surprised it has remained so small?

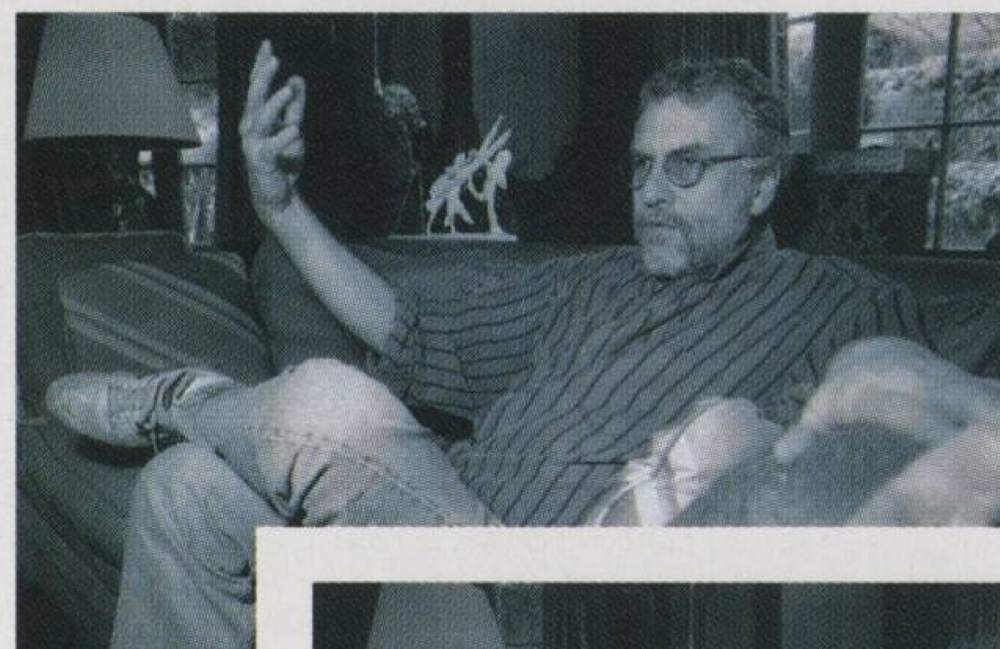
Nolan I had no perception of what big was and what small was when I started. Starting a company and having it grow to $3-5 million was about as big as my horizon was at that time. If someone had said $8 billion in the US and $5 billion worldwide bringing in $13 billion dollars, I would have said, 'Wow!' And if you had said that, per year, it would be bigger than all of Hollywood's movies combined – by several times – you would have seriously stretched my sense of credibility. So, no, I didn't anticipate it at all.

Edge What do you think have been videogames' greatest achievements over the last 20 years?

Nolan Games, because of their fast action and realtime nature, have always had to remain faster and better than the standard computer business. If you really look at the very early games we did, there were no actual 'computers' at all. *Pong* and *Tank* were solid-state machines – at the time you couldn't get a computer to execute instructions fast enough. It was almost five years after the videogame was introduced that there were any serious microprocessors, and then there were so many hardware assists that the fact that there were microprocessors in there was almost insignificant. And so what happened is that, as the processors started to catch up with the requirements of the game systems to do the executions that were necessary, the game business pioneered the methodologies and probably set the computer business forward five years.









Edge You're saying that the games industry dictated the pace of computer technology development, not vice versa?

Nolan Right. Because most of the hard technology was developed on the games side and then ported over into the computer side. So that's probably one of the major things that the game industry did. Another real tour de force has been the software created to handle simultaneous graphics and sound – that's hard stuff. And that has, in turn, paved the way for some of the conference call and picture compression technologies.

Edge Any specific titles spring to mind?

Nolan In terms of things that have been really trick stuff, *Doom* was something that could have been done before, but the overall effect that was achieved with a relatively truncated and closed environment really surprised a lot of us.

Edge That's technological enhancement, but how about what makes the game itself? Do you think gaming has evolved?

Nolan Yes. In 1995 there are many more things that are known about what makes a game tick. But the problem is, the human being, when it comes to leisure, is a fickle sort. And no sooner do you think you have them figured out than you lose.

Edge What still needs to be accomplished?

Nolan No-one has really figured out what the 'she's' really want. And the 'she's' represent a very interesting opportunity for all of us. It turns out that I think I've actually figured it out. It came to me not through any great insight of mine, but through observation of my daughter. I have three daughters, one ten and two older, and none have been that interested in games. Whereas all my sons are. And then one day I came home and my daughter was down in my lab with a bunch of friends, just laughing and chuckling. They turned off the machine as soon as they saw me, but I turned it back on and finally I was able to figure out what she had been doing. All of a sudden it was like the light comes on...

Edge But you're not going to tell us what that is?

Nolan I know I'm been purposefully vague, but all will be made clear this fall.

Edge You're famous for having attended the early Atari board meetings in sneakers and Black Sabbath T-shirts. Most of the staff were hippies and it's been said that the smell of marijuana wafted through the air conditioning. You described Atari's employees as 'people who wanted to make games, not bombs'. Do you think that a small, idealistic startup as unique as Atari was in the early 1970s could thrive today against Sony and Nintendo?

Nolan I don't think entrepreneurship can ever be stopped. But at the same time, there is, as sure as I'm sitting here, a startup in a garage somewhere that will be significantly more successful than anything that is out there. I have no idea who it is, but it's out there. There is also a major shakeout that will happen over the next ten years in the games business. And that is the transition from 'closed' to 'open' systems. No closed system has survived longterm, in history, in virtually any kind of marketplace. There can be cartels in certain situations – the De Beers diamond mines, for example – but when it comes to something as interesting and as different as information (and games are nothing more than information) it can't be controlled, and ultimately the barriers will come down and the systems will become open. And maybe what we're really seeing when you say that you can't sell a 3DO for $700 but you can sell a whole bunch of PCs is the first javelin over the walls of the world devolving into an open system.

Edge This is also Trip Hawkins' opinion. Do you think Trip is on the right track with the rest of his 3DO plans?

Nolan Well, I liked to tease Trip by saying, 'Gee, Trip, I found out with three million dollars what has cost you over a hundred million dollars to find out!' And that is that it's very difficult to sell significant numbers of anything at over $500. In the 1980s, I sold some technology to Commodore and spearheaded their movement for CDTV. Almost four years before 3DO, I had a machine which, to all intents and purposes, was equivalent to 3DO. I felt that I could sell a hundred thousand of something that costs $800 standing on my head. And I can tell you that the number of units that we sold in the United States at $700 you could put in your eye and not draw tears.

Edge So why are so many people willing to spend $2500 on a PC purely to play games?

Nolan I think that it's impossible to divorce the business potential or the perceived business potential from the PC.

Edge So people are buying these machines, kidding themselves that the expense is worth it because they might use the technology for business and not just games?

Nolan Nobody buys a computer, everybody buys software. The computer just happens to be a harassment that is necessary to play the software.

Edge The next generation of games platforms – PlayStation, Saturn and Ultra 64 – are all 'closed' systems. Are 1995's gaming moguls making a mistake?

Nolan I can't really say that keeping a closed system in the short run is wrong. It's a way to create tremendous cash flows and profitabilities. You can build a very good coffer. If I were them, though, I would be very concerned about how I would make the transition to an open system. And that's gonna be very dicey, because big corporations don't eat their babies very well. And what I mean is that you can't do things that are important to your future without hurting your current business. The capital that is involved in the Sega and Nintendo name and infrastructure and all that stuff will be destroyed when the thing goes to an open system. So could you see Nintendo doing that to themselves? I don't think so.

'I liked to tease Trip by saying, "Gee, Trip, I found out with three million dollars what has cost you over a hundred million dollars to find out!"'

Edge When you look at Atari today, what do you see?

Nolan I see a very powerful set of technologies. Unfortunately, what has happened is that Atari started too late to become a mainstream competitor. And it had a tremendous disadvantage because it didn't have the Japanese marketplace as feeder stock for games software. That put them at a disadvantage. It's not over for them. In fact, I'm trying to do some work on a couple of projects with them and it still could be pulled out, but it's going to take more than just good technology to do it. They will have to do some interesting marketing. They have to get to a couple million set-tops before they have the basic infrastructure to carry on.

Edge Do think that the Japanese companies have irreversibly overtaken US companies as the world leaders of gaming?

Nolan There is a huge built-in gameplaying population in Japan that allows the domination – or at least a significant financial benefit – to any company that has access to that. And foreign companies have difficulties addressing that market. Whether over time the Japanese market can be more open is anybody's guess. But we do see a tremendous amount of things happening, with Apple moving there and regular DOS machines increasing in number instead of the bastardised DOS they've been using for years. 3DO has done well there too. So I believe that the way that American companies will penetrate the Japanese market is going to be through the open gaming platforms, such as the PC.

Edge Is the arrival of Sony, the first 'outside' company to enter the videogames arena, a good thing?

Nolan It could be good for consumers if Sony did it the right way. But I see no sign that they're trying to do it the right way. There are so many things that need to be done with games that are interesting and fun and that people would want to do; things that have very little to do with slapping a cart in a slot and playing with the joystick. That's clearly the market now, but they're doing very little to create the market of tomorrow.

Edge It's ironic that Philips – a mainstream electronics company – makes a multimedia machine, whereas Sony – the world's biggest multimedia company – makes a pure games machine…

Nolan It's really bizarre that Sony has innovated so narrowly in the existing field. They basically entered the polygon war, and that's about it. They've got some pretty good software titles, but I always look at businesses that are really pushing the state forward in terms of innovation.

Edge Presumably, networking is the next big thing in videogames…

Nolan Communication, when added to the witches' brew of high MIPS in the living room, leads to a whole new set of things, which I think will become dominant. I'm going to be so bullish as to say that the non-linked computer will be obsolete in five years. My goal is to have 10,000 people playing against 10,000 people. And to have it televised, and to have interviews with some of the leading contenders. When you get that many people involved in anything, just by extrapolation of your parents and girlfriends and boyfriends, we could probably create a viewership of 10-20 million without even trying.

Edge It's a fantastic concept. The problem is giving each player a meaningful role…

Continued next page

Nolan Right. And you do that through what I call the 'bubbling pot method of participation'. It's kind of a dynamic double elimination. It will all be clear shortly.

Edge A lot of other people think the Holy Grail of gaming development right now is the interactive movie – a computer-generated world so realistic that it might as well be a movie, in which you play the lead, and you decide what happens. What is your opinion of the 'interactive movie'?

Nolan I believe there are some interesting disconnects. If you take a traditional movie, the objective is immersion. You want to get the person so involved in the reality of the characters, of the situation, of the dynamic, that you lose self, totally, and become an observer; it becomes a fantasy roleplay. But the minute you ask the person to respond, you force them back into their self. And that's a disadvantage to the whole 'interactive movie' concept, it seems to me.





When you're playing a traditional game, again you're in a different kind of immersion. But it's an immersion in which the joystick retreats – like when you type but you're no longer thinking of the keyboard, but of letters appearing on pages, and the intermediate apparatus goes away.

Again, loss of self. And so you say, 'Well, gee, loss of self in a traditional game, loss of self in an interactive movie' and you weigh up the two experiences I outlined. 'They're about the same,' you think. But they're fundamentally different because that loss of self on the game side doesn't happen instantly. When you first pick up the joystick, you were thinking very well, it's only through the compellingness of the game that you lose self in the manipulation.

Edge So is the 'interactive movie' concept fundamentally flawed?

Nolan I have a chart downstairs that I used for a speech, half humorously, in which I plotted button clicks per hour as a measure of interactivity. The highest activity is 10 per second (that's a high-paced videogame) and at the other end of the scale is once every hour and a half (that's the play button on the VCR). We have well defined the once every hour and a half as a market and we have well defined from ten a second up to a couple hundred a minute. But in the middle area, the netherworld, between 10 a minute and one in an hour and a half, is very unexplored territory, and the world is littered with the decaying bones of attempts in that area. I cannot think of a single success.

Now, I don't believe that the world is that disconnected, I believe the world is a continuum. Very seldom do you see statistical distribution like that. So I believe there's something there too. I just don't believe we've come close to discovering what it is yet.

Edge Do you think that games are now more fun to play than *Pong* was?

Nolan Yes and no. In some ways – because of technical limitations – we had to focus exclusively on the essence of game, not production values. And so we spent tremendous amounts of time trying to do things like calibrating how much a quarter turn of the control dial resulted in how much movement on the screen. Why does that matter? Well, it turns out it matters quite a bit because certain people have very good muscle skills and some people don't. And you wanted to match that. And you didn't want to have them turn too far, because then there would be wrist problems. There are so many tiny issues in a game that literally you could change 10% and double the revenue of the coin-op.

Edge And the arcades of today are lacking some of this craftsmanship?

Nolan Well, the coin-op side also had a very interesting capability that seems to have been lost, in that it was the way games were presented to the public first. And then the game migrated to the consumer side. Right now coin-op games have been relegated to a driving game and a ninja punch-kicking game. You don't find anything else out there. Plus the arcades are increasingly becoming a sideline – fewer and fewer people go to arcades. The people that do go spend increasing amounts of money, but it seems like it's filtering itself to oblivion. And I think the coin-op business needs a huge reset, because so many of the games are just not fun to a majority of the people. And so the typical person happens to wander into an arcade to see what's happened in the last 10 years, looks around, shakes his head and says, 'There's really nothing in here for me.' I think that's bad, I think it's a real problem.

Edge Whereas *Pong* was for everybody?

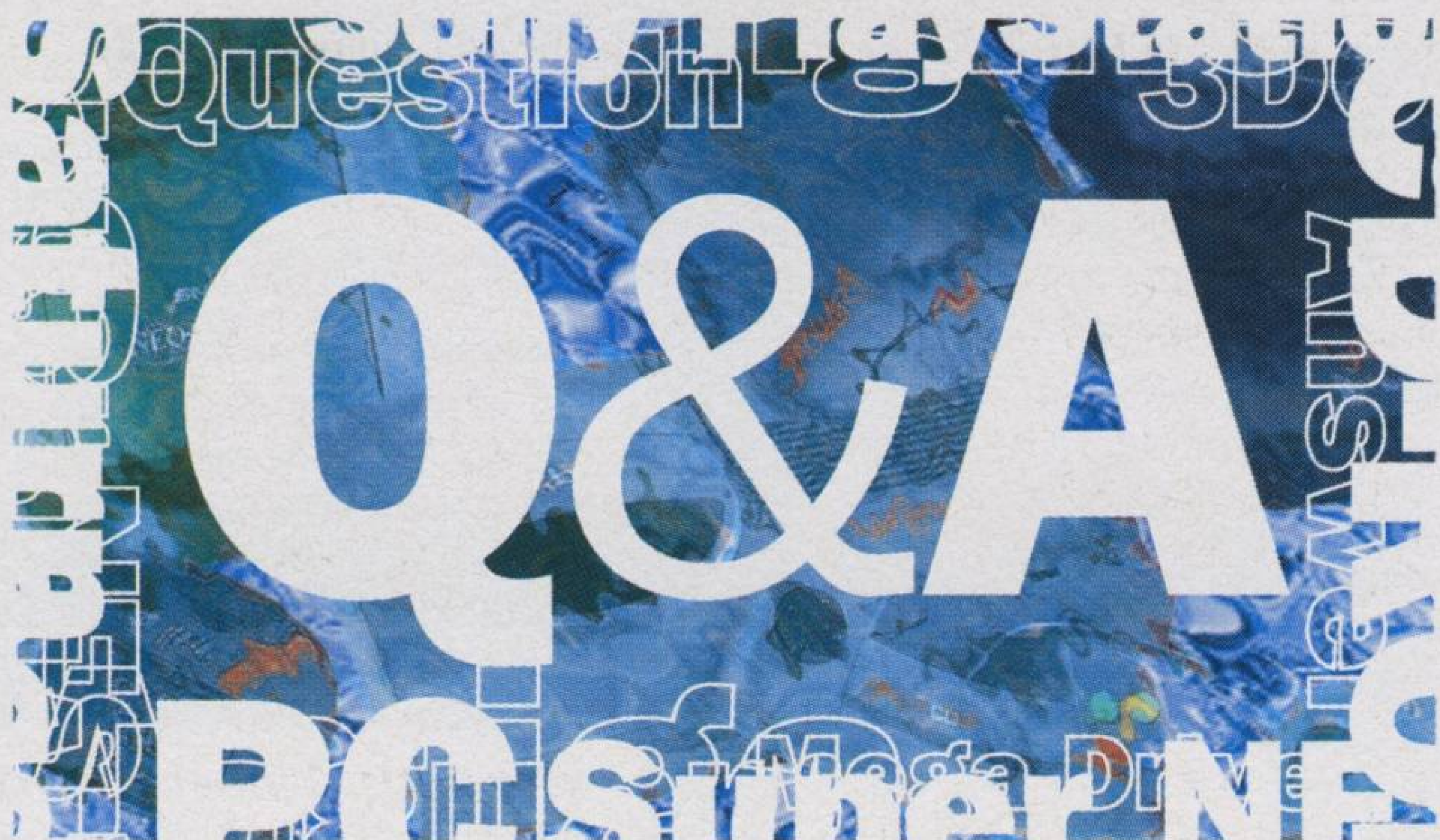
Nolan *Pong* had an interesting characteristic. Since there was no oneplayer version, it was in fact a social lubricant in many instances. It was very common to have a girl with a quarter in hand pull a guy off a bar stool and say, 'I'd like to play *Pong* and there's nobody to play.' It was a way you could play games, you were sitting shoulder to shoulder, you could talk, you could laugh, you could challenge each other – that sort of thing.

Edge You also had one hand free to hold your beer, or whatever…

Nolan Yes. And in fact, as you became better friends, you could put down your beer and hug. You could put your arm around the person. You could play left-handed. In fact, a lot of people have come up to me over the years and said, 'I met my wife playing *Pong*…'

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questiontime



Send your **questions** to Q&A, **Edge**,
30 Monmouth Street, Bath, Avon BA1 2BW

Q **1.** I have a Yamaha MSX (a CX5M Music Computer) and the following Konami cartridges: *Soccer*, *Yie Ar Kung Fu 2*, and *Gradius/Nemesis*. Could you give me more information about this personal computer/console hybrid (such as specs, history, games, etc)? All I presently know is that it was a Microsoft-licensed product, released in the mid-'80s, with versions made by other companies, including Toshiba.
2. Although I remember hearing about a console called the Vectrex when I was younger, I can't recall ever seeing the actual machine or any of the games. Could you possibly print a few shots for old times' sake, or even just print a few details about this old-school console?
3. Now that the Saturn has been released, are you aware of any games that are planned to be released in cartridge format for the machine? Or, for that matter, any hardware that takes advantage of the cartridge slot at the rear of the machine?

Andrew Cranshaw, Leeds



What exactly was the Vectrex, and what happened to it? (See letter from Andrew Cranshaw)

A **1.** As mentioned briefly last month, despite enjoying a huge marketing push at launch, the format died a rather undignified death in the UK. It was hugely successful in Japan, where the standard even got as far as a second generation (MSX2). Konami was responsible for much of the format's success – its cartridge titles, including the first to incorporate custom DSP chips, blew away everything else available in the home at the time.
2. This vector graphics gaming system was Milton Bradley's attempt at wrenching market share from Atari, whose VCS (aka 2600) was in wide use in the early '80s. The machine used an upright monochrome monitor, with coloured plastic screen overlays supplied with each game. Its software included *Web Wars* and *Spike* – one of the first games to include speech.
3. The slot is for an SRAM back-up cartridge. It could be used for games cartridges or even a 32X-style upgrade, but it seems a bit odd to buy a CD-ROM console and then use it to play cartridge games.

Q Having just bought an imported Saturn, I would like some questions answered please.
1. How long does the battery in the machine last?
2. Judging by *Clockwork Knight* and *Daytona USA*, the machine's texture-mapping abilities are very good. Does this mean that an arcade-perfect *Virtua Fighter 2* is possible, as it uses less polygons than *Virtua Fighter* and relies more on texture mapping?
3. Why are we forced to pay twice what the Japanese are paying for their machines?

Scott Adcock, Birmingham

A **1.** Expect it to last about five years.
2. As with *Daytona USA* on the Saturn, don't expect an arcade-perfect conversion. The fighters themselves will probably be pretty faithful to the coin-op, but Yu Suzuki's AM2 will have difficulty reproducing the arcade game's polygon-heavy backdrops, and it is inevitable that the frame rate will be halved (as it has been for *Daytona*).
3. Most imports are subject to VAT (17.5%), payable upon entry into the UK. Import duty is also applicable (this varies but is approximately 6% for videogaming equipment), and shipping costs have to be added on top of that. Plus, of course, importers are currently taking advantage of buyers' eagerness to get their hands on next-generation machines, and profiteering accordingly. Official UK prices will be much more reasonable (sub-£400).

Q **1.** Why does a CD games machine come under the additional government tax levied on VCRs? All the available CD machines are incapable of showing a film (never mind actually recording in the way that a VCR can) without additional hardware.
2. What is the PlayStation's available memory as standard? Does the machine only access the CD once, or does it also access it for extra levels, etc?

Dave Bettany, Manchester

A **1.** The 3DO suffered in this respect because it was a self-proclaimed multimedia machine – it had the capability of playing movies, albeit with the help of an upgrade (the MPEG module). Sony claims that the PlayStation will not be taxed in the same way, and other manufacturers of CD-based machine should be able to work around the restrictions.
2. It has a 3Mb RAM cache, as well as 512K of buffer RAM for the CD-ROM drive and 512K sound RAM. Some games load completely at startup (eg *Ridge Racer*) while many others access at various points throughout.

Q This summer I am planning to go to Hong Kong. I want to get a Saturn there, but from what I've heard, the PlayStation is beating it in terms of software and power. The only reasons to buy a Saturn are *Virtua Fighter 2* and *Daytona*. If you could answer my questions, maybe it would boost my confidence in Sega again.
1. I've heard that *VF2*, *Daytona USA* and *X-Men* are nearly finished on the Saturn. When will they be out in Japan?
2. I know for a fact that Sega is releasing a range of controllers for the Saturn – for example, a six-button joypad. Please could you tell me what add-ons are planned.
3. Can you use a Japanese Saturn on an English TV with the use of a SCART lead and a transformer? Plus, what other problems might arise if I brought back a Saturn from Japan? Also, is there a PAL Saturn available?
4. What is the difference between the V-Saturn and the Sega Saturn?
5. What extra bits will the UK and US machines have?

'Pepperouchau', Oxford



Will the UK Saturn differ from the Japanese model? (See letter from 'Pepperouchau')

A **1.** *Daytona USA* is due at the beginning of April; the others have no firm release date yet.

2. A mouse and a fighting stick are already available, and there are also plans for a steering column (see **Edge** 19) and a multiplayer adaptor.
3. The Saturn uses a customised connection port, and can be used with a multistandard TV offering standard AV and S-Video sockets. You'll need a step-down transformer to deal with the UK power supply standard, and a SCART lead (importers stock them) to run it on a non-multistandard TV. No official PAL Saturn will be available until the European launch.
4. JVC's V-Saturn is merely a standard Saturn manufactured under licence from Sega. There are also models on the way from Yamaha and Hitachi.
5. Although Sega has apparently hinted at US/UK modifications, it's highly unlikely that it will make radical alterations for fear of software incompatibility. The issue of fullscreen video output has yet to be decided.

Q Regarding the Sega/Atari crossover deal...
1. Will the Jaguar be able to handle *Virtua Fighter* if it comes out on the machine?
2. Does the CD-ROM drive improve the Jag's 3D abilities?
3. How does the Saturn compare with the Jag in terms of 3D? How many polygons can they manage?

T Clark, Guildford

A **1.** A Jaguar version of *Virtua Fighter* would be less impressive than the Saturn game – the Jag doesn't have the computation power to match the Saturn's twin SH-2s.
2. No, apart from the built-in Virtual Light Machine, it's used purely as high-capacity storage. It's possible, though, that the Jaguar CD will be used to stream pre-calculated 3D geometry, which would increase the level of detail that could be rendered in some types of 3D games.
3. There are no absolute criteria which can be used to compare the two machines, but the Saturn is more powerful all round. Of course, both machines have so few titles that we've yet to see what they're truly capable of.

Q I am a regular reader of **Edge** and I'm thinking of buying an imported PlayStation. Is it absolutely essential to buy a £50 NTSC-to-PAL converter for the import machine to work? Isn't the only advantage a display that runs without borders? I have a Ferguson 22H1 television.

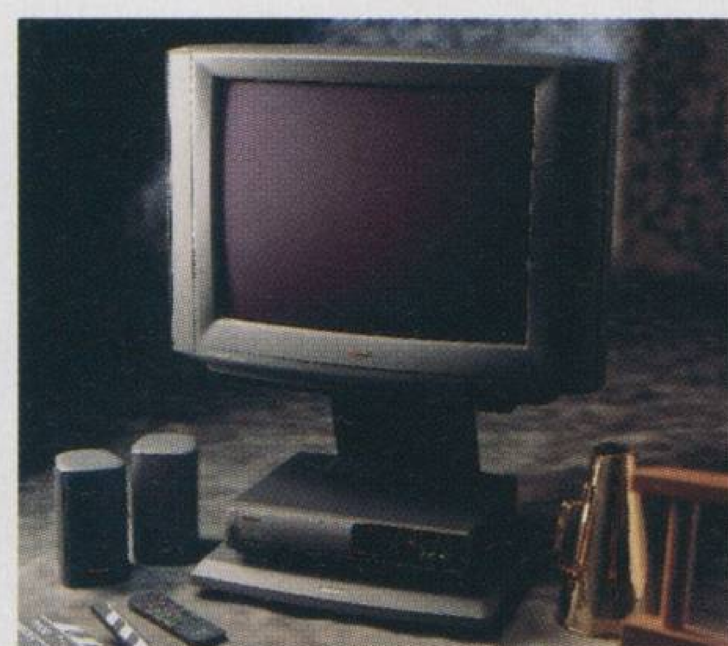
Matthew Hutchinson, County Antrim

A You only need an NTSC-to-PAL converter if you haven't got a multistandard TV, or the console has no RGB output – like the 3DO, for example. In the PlayStation's case it's simply that there's no RGB SCART lead available. Converters work by taking an NTSC composite or S-Video signal and converting it to PAL colour. Without one, you'd get a monochrome image rather than a bordered display (usually the result of a signal modulation from 60Hz to 50Hz).

Nowadays, many TV manufacturers produce NTSC-compatible sets. But beware of the difference between NTSC 3.58 (true NTSC) and NTSC 4.43 (quasi PAL – the signal transmitted by most 'NTSC-compatible' VCRs). Sony's new KV-A range supports NTSC 3.58, so you can plug the PlayStation (or any Japanese or US console) straight into the TV using any connection (except the RF aerial socket). **Edge**'s machine connects to a Sony KV-A2132U through its S-Video socket, giving a superb picture.

Q **1.** Are any console companies planning to use HDCD in the near future? If the technology becomes available by the middle of next year, surely another generation of consoles will emerge? 3DO could base its M2 system on HDCD technology and Nintendo could hold out to use it in the Ultra 64 CD-ROM. In either case, surely Sony isn't just going to sit back and watch the PlayStation get trampled in the HDCD stampede?
2. What exactly are set-top boxes? Who is involved? And when will they emerge in Japan, America and the UK?
3. When are we likely to see the first VR machines for home-based use? And by VR I mean proper full-colour, stereoscopic, motion-tracking HMDs presenting a 1:1 scale 3D playing environment, not the monochrome reflective lens shambles that Nintendo tries to imply is virtual reality. And is anyone hard at work developing a VR game machine specification for domestic use?

B H, Wetherfield



Many new stereo TVs will accept an NTSC signal (see Matthew Hutchinson's letter)

A M2 is being designed to take advantage of HDCD in some form – perhaps that's why we haven't seen the arrival of the MPEG adaptor for the standard 3DO. However, it will take some years for HDCD to become a massmarket format. Sony and Philips may have agreed on the technology that they will be using (DVD), but the rest of the consumer electronics industry won't necessarily follow suit (see news). The PlayStation's own video playback is good enough for videogames, but should playing movies ever be on the PlayStation's agenda, Sony will no doubt consider releasing an HDCD adaptor. Unless VideoCD gets a firm foothold in the market in the meantime...
2. 'Set-top boxes' is the name given to a range of technological gizmos that are intended to have a close relationship with your home TV set. Satellite/cable TV networks and telecom companies the world over are pinning their hopes on the set-top box to make concepts such as interactive television a reality. The set-top box is the interface between the viewer and the network server, downloading games, movies and other services directly into the home. Expect some big announcements soon in Japan regarding the future of interactive television.
3. Virtual reality systems such as those from Cybermaxx and Forte are available for the PC, although the results are hardly impressive. Effective VR, with a display you can actually see clearly (and that doesn't give you a headache after five minutes), will take time to reach the home primarily because of the cost of the head-mounted displays.

Q **1.** From what I've heard, the Ultra 64 will be as powerful as an Onyx. If this is true, just how powerful is an Onyx and how does it compare to Sega's Model 2 arcade board?
2. In issue 12 you claimed that *Killer Instinct* and *Cruis'n USA* run using a 'proprietary Williams chipset'. Does this mean that the final Ultra 64 will be more powerful, or are these two games a real indication of the power of the Ultra 64?

Ritesh Solanki, Leicester

A **1.** An Onyx uses the MIPS R4400 chip, which runs at 150MHz (128MIPS). Deskside models can use up to four R4400s, while the rack systems will accommodate 28 chips, delivering up to 1.6 million texture-mapped, Gouraud-shaded and z-buffered polygons every second. This far exceeds the performance of Sega's Model 2. The chip that will be included in the Ultra 64 is a single customised R4300 running at 100MHz. (See news for more details about the Ultra 64.)
2. *Cruis'n USA* uses Williams' own polygon rendering board, while *Killer Instinct* shares some hardware with the Ultra 64. According to the claims made by Nintendo and Silicon Graphics, the Ultra 64 will have graphical capabilities far beyond those seen in existing Williams/Nintendo coin-ops.

Q and A

You can rely on Edge to cut through the technobabble and give you straight answers. Write to: Q&A, Edge magazine, 30 Monmouth Street, Bath, Avon BA1 2BW. Alternatively, fax us on 0225 338236, or e-mail us at edge@futurenet.co.uk.

Edge regrets that it can't answer questions personally, either by phone or by post.

next **month**

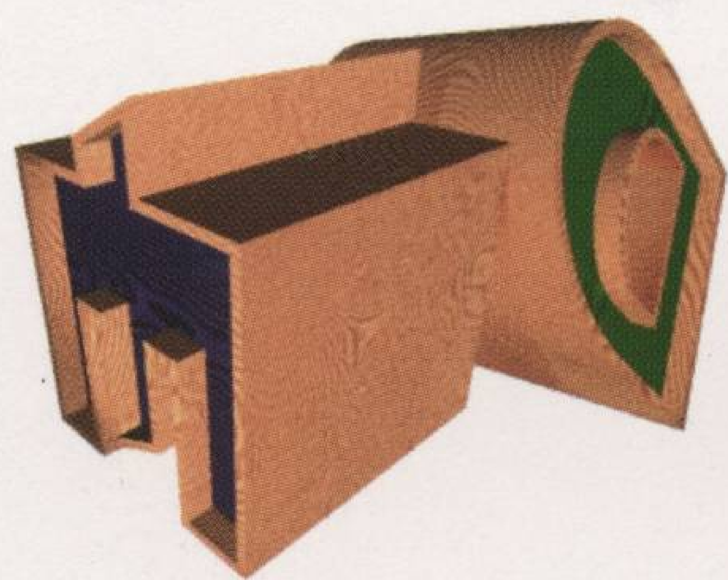
DAYTONA USA

Next issue **Edge** takes control of *Daytona USA* on the Saturn. For those sitting on the sidelines in the battle of the consoles, this AM2 release could prove to be the deciding factor.

Plus: **Edge** infiltrates Nintendo's Kyoto HQ to meet game guru Shigeru Miyamoto. With potentially the world's most powerful games system at his disposal, just what is Miyamoto-san up to?

Issue **twenty-one**

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